96-118

TAX CREDITS TO HOMEBUILDERS USING PASSIVE SOLAR DESIGN AND BUILDING TECHNIQUES

HEARING

BEFORE THE

COMMITTEE ON WAYS AND MEANS
HOUSE OF REPRESENTATIVES

NINETY-SIXTH CONGRESS

SECOND SESSION

ON

H.R. 7688, H.R. 7690, and H.R. 8019

BILLS TO PROVIDE A TAX CREDIT TO HOMEBUILDERS FOR THE CONSTRUCTION OF RESIDENCES INCORPORATING CERTAIN PASSIVE SOLAR DESIGN AND BUILDING TECHNIQUES

SEPTEMBER 8, 1980

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TAX CREDITS TO HOMEBUILDERS USING PASSIVE SOLAR DESIGN AND BUILDING TECHNIQUES

MONDAY, SEPTEMBER 8, 1980

HOUSE OF REPRESENTATIVES,
COMMITTEE ON WAYS AND MEANS,
Washington, D.C.

The committee met, at 10 a.m., pursuant to notice, in room 1100, Longworth House Office Building, Hon. Al Ullman (chairman of the committee) presiding.

The CHAIRMAN. The committee will be in order.

Today the committee is conducting a 1-day public hearing on H.R. 8019, H.R. 7688, and H.R. 7690, bills to provide a tax credit to homebuilders for the construction of residences incorporating certain passive solar design and building techniques.

Without objection, I would like to insert in the record at this point a copy of the press release announcing today's hearing.

[The press release follows:]

[Press release of Aug. 26, 1980]

HON. AL ULLMAN (D., OREG.), CHAIRMAN, COMMITTEE ON WAYS AND MEANS, U.S. HOUSE OF REPRESENTATIVES, ANNOUNCES A 1-DAY PUBLIC HEARING ON MONDAY, SEPTEMBER 8, 1980, ON BILLS TO PROVIDE A TAX CREDIT TO HOMEBUILDERS FOR THE CONSTRUCTION OF RESIDENCES INCORPORATING CERTAIN PASSIVE SOLAR DESIGN AND BUILDING TECHNIQUES

Hon. Al Ullman (D., Oreg.), Chairman, Committee on Ways and Means, U.S. House of Representatives, today announced that the Committee on Ways and Means will conduct a 1-day public hearing on Monday, September 8, 1980, beginning at 10 a.m. in the Main Committee Hearing Room (1100 Longworth House Office Building) on H.R. 8019 (Mr. Ullman), H.R. 7688 (Messrs. Fowler, Heftel, Pickle, Downey, Duncan, and other cosponsors), and H.R. 7690 (Mr. Heftel and Mr. Fowler), to provide a tax credit to homebuilders for the construction of residences incorporating certain passive solar design and building techniques.

The bills would amend the Internal Revenue Code to provide a maximum tax credit to the builder of $2,000 for a residential unit incorporating a passive solar energy system if the unit is completed after September 30, 1980. A passive solar energy system would be defined as a system containing a solar collection area, an absorber, a storage mass, a heat distribution method and heat regulation devices. However, swimming pools are explicitly excluded from the bill. The credit would be based on the effectiveness in reducing the energy load and would phase down to $1,500 in 1986, $1,000 in 1987, and $500 in 1988. No credit would be allowed under the bills for residential units completed after December 31, 1988. In addition, anti-double-dipping rules are provided to coordinate the passive solar energy credit with other government subsidized energy financing.

The Committee will receive testimony from representatives of the Department of the Treasury, the Department of Energy and other Administration officials, to be followed by testimony from Members of Congress and the general public who have requested to be heard.

Individuals and organizations interested in presenting oral testimony before the Committee at this hearing should submit their requests to be heard in writing to

John M. Martin, Jr., Chief Counsel, Committee on Ways and Means, U.S. House of Representatives, 1102 Longworth House Office Building, Washington, D.C. 20515 (telephone: 202-225-3625) not later than the close of business, Tuesday, Sept. 2, 1980. Notification to those scheduled to appear will be made by telephone as soon as possible after the filing deadline.

The limited time available to the Committee requires that all persons and organizations having a common position make every effort to designate one spokesman to represent them in order for the Committee to hear as many points of view as possible. Time for oral presentations will be strictly limited, with the understanding that a more detailed statement can be submitted for the Committee's review and for inclusion in the printed record of the hearing. This will afford more time for interrogation of the witnesses by the members of the Committee. If it becomes necessary, the staff of the Committee will group the witnesses into panels to expedite the hearing and will establish time limitations for each panelist. Should a change in the witness or the need to cancel arise, notification should be made to the Committee immediately.

Following is an outline of the information to be supplied by organizations and individuals who may either want to appear and testify during this hearing or file a written statement for the printed record of the proceedings:

1. The name of the witness, his title, address, firm affiliation and/or organization he will represent (as well as a telephone number where he or his designated representative may be reached).
2. If appearing in an individual capacity, a list of any clients at whose request or in whose employ the witness appears.
3. A topical outline or summary of comments and recommendations.

The above information should also be incorporated in the prepared statements to be presented in person as well as those filed for the printed record of the hearing.

Witnesses will be required to submit 75 copies of their prepared statements to the full Committee, Room 1102 Longworth House Office Building, at least 24 hours in advance of the appearance. For those who wish to file a written statement for the record of the hearing, five copies are required and may be submitted not later than the close of business Friday, September 12, 1980. An additional supply of statements for either a personal appearance or for the printed record of the hearing may be furnished for distribution to the press and public, if supplied to the Committee office before the hearing begins.

The CHAIRMAN. Before I welcome our first witness, let me say that I believe the time has come to take specific action on this matter.

We have accommodated the active solar investment, I think, in a very generous way and a very meaningful way. Now is the time to move on passive and to put very clear incentives in the code for people to take advantage, take full advantage, of the opportunity for energy conservation in the building of homes.

We begin this morning with testimony from Dr. Thomas E. Stelson, Assistant Secretary for Conservation and Solar Energy, Department of Energy; and Moshe Schuldinger, Attorney Advisor, Office of Tax Legislative Counsel, Department of Treasury, who will be presenting the statement of the Honorable Donald C. Lubick, Assistant Secretary for Tax Policy.

I understand Mr. Lubick is testifying before the Senate Finance Committee this morning, but hopes to join us later.

Welcome to the committee, Secretary Stelson. We would be very pleased to hear you, and then we will recognize the other members of the panel.

READEX FICHE

STATEMENT OF THOMAS E. STELSON, ASSISTANT SECRETARY FOR CONSERVATION AND SOLAR ENERGY; DEPARTMENT OF ENERGY, ACCOMPANIED BY FREDERICK MORSE, ACTING DIRECTOR, OFFICE OF SOLAR APPLICATIONS FOR BUILDINGS; MICHAEL MAYBAUM, DEPUTY DIRECTOR, OFFICE OF PASSIVE SOLAR ENERGY, DIVISION OF CONSERVATION AND SOLAR ENERGY; AND EDWARD BLUM, DIRECTOR, ADVANCED TECHNOLOGY, OFFICE OF POLICY AND EVALUATION

Mr. STELSON. Thank you.

I would like to introduce the people that I have with me on my left, if that is all right.

The CHAIRMAN. Yes.

Mr. STELSON. On my immedate left is Dr. Edward Blum, Director of Advanced Technology in the Office of Policy and Evaluation at DOE.

Next, Dr. Frederick Morse, who is the Director of the Office of Solar Applications for Buildings, and on the far left Mr. Michael Maybaum, who is the Deputy Director of the Passive Solar Division of Conservation and Solar Energy in DOE.

I am delighted to be here, and it is a pleasure for me to present the Department of Energy's position on these three bills which are measures to provide a tax credit for homebuilders for the construction of residences incorporating passive solar design and building features.

Currently, there are no Federal tax credits existing for passive solar systems. Speaking for the administration, I am happy to reiterate our support for builder tax credits for passive solar residences.

In April 1979 the President proposed and endorsed a passive tax credit for builders. The administration continues to support this approach to stimulating rapid and widespread use of an important, basically simple, but widely misunderstood technology. Passive technologies can lead to a large number of Americans, in cities, suburbs, and rural areas, having homes that are comfortable yearround with minimal dependence on their local utilities and with very low utility bills.

I would like today to describe why we think this approach is so important, to try to help clarify some of the points that may have led to misunderstandings about it last spring—in case some of them persist, and to illustrate the attractive, functional, comfortable, very-low-energy-consumption homes that this bill would help stimulate.

A passive solar system uses elements of the building to collect, store, and distribute energy with minimal dependence on mechanical equipment. Generally, the flow of energy is by natural means. However, most passive systems involve some mechanical means to enhance thermal control.

Passive designs include:

Direct gain systems which utilize south facing solar glazing to capture and hold the heat from the Sun within the dwelling unit;

Thermal mass systems which utilize rocks; masonry, adobe, and other dense materials to retain or dissipate the heat which has entered the dwelling through glazing walls or roofs;

Third, thermal ponds which utilize tanks of water or other liquids to retain or dissipate the heat which has entered the dwelling;

Fourth, sunspaces with a southern exposure which retain warm air outside the heated portion of the house and help reduce the heating load of the house; and lastly they can include:

Thermosyphon systems which utilize the natural convective flow of air through carefully positioned louvers and vents to circulate air within a dwelling.

I have a package of materials here which I have distributed to the committee that illustrates examples of energy savings, along with pictures of passive housing systems and other informational material that might provide useful background.

The CHAIRMAN. We appreciate that material, and it will be included in the file and, without objection, any appropriate parts will be included in the record.

Mr. STELSON. Thank you.

Passive solar systems have the potential to significantly reduce the fossil fuel energy requirements for residential structures. Successful examples of passive solar residential heating systems have been demonstrated throughout a broad range of U.S. climates resulting in reduction of energy consumption from 30–80 percent.

At the present time, residential builders have not undertaken the construction of homes with passive solar systems in significant quantity. There are two fundamental reasons for this situation;

First, builders are not familiar with passive solar technology and construction methods. Second, builders are unsure of the market for residences with passive solar systems. The purpose of the credit is to provide an incentive for builders to invest money to obtain a good passive solar design and to market passive residences.

The benefit to the homeowner will be reduced energy costs over the life of the residence. The benefit to the Nation will be reduced consumption of fuel, particularly oil and natural gas.

As passive solar energy systems become more familiar to the building industry and the public, there is likely to be a growing demand for passive solar retrofit of existing homes. This could add significantly to the national energy savings induced directly and indirectly by the passive solar tax credit.

We feel that a tax credit will stimulate the passive solar market now in order to attain these benefits. An incentive is essential for encouraging builders to modify their traditional construction methods until a more clearly defined market demand has been established. Estimated impact of the credit will be over 500,000 units through 1990 with a savings of 180 million barrels of oil equivalent.

The tax incentive also has broader national implications in that it will incrementally increase the total number of housing units provided over the next 8 years, due to increased marketability of energy efficient homes. It is expected to cut passive commercialization time in half based on the experiences of other innovative products which have been introduced into the housing market.

In addition, passive solar heating designs for residential buildings are ready for the marketplace. Most materials and construction methods needed for commercialization are now commonly employed in building construction; serious environmental, net energy,

or institutional drawbacks are not anticipated with their adaption for passive systems.

Successful examples of passive solar buildings have been demonstrated throughout a broad range of U.S. climates. Our data indicate that the additional installed cost for the passive solar system varies between $2,000 and $8,000, depending on the type and size of the system and the type and location of the house.

While passive solar heating designs for residential buildings are ready for the marketplace, specific technical developments are required in other areas. Advances are necessary in passive cooling, advanced passive products that can be easily integrated into buildings; and passive technology in commercial buildings as well as certain design tools.

The DOE national passive and hybrid solar program is addressing these areas while working closely with the building industry.

In regard to specific provisions of the legislation, while it does not insure that the incentive will be passed on to the homebuyer, it is designed to cover the builder's added costs and risks. The availability of the tax credit to all builders will provide for a competitive environment that will encourage that the tax credit be passed on to the homeowner. This incentive will help overcome the risk which a builder undertakes in building a new product which will accelerate the number of passive solar installations.

The proposed legislation clearly defines what does and does not qualify as a passive house. We anticipate few problems with regard to this question.

To be eligible for the tax credit a builder must construct a passive residence that contains all of the following five basic elements:

One solar collection area; two, an absorber; three, storage mass; four, heat distribution method; and five, heat regulation devices.

Conventional homes with picture windows are not eligible. Also, swimming pools are excluded from the bill's provisions.

The methodology for determining the credit is uncomplicated and involves a simple two-step process. The two steps involve filling out a brief form which identifies the requisite passive solar components, and then determine the amount of the credit from a tax credit table.

The process will allow a builder to very quickly determine eligibility for the credit and the credit amount. The amount of the credit is based on the predicted performance of the passive system. Therefore, homes that are more energy conserving and incorporate large passive solar systems are eligible for a higher credit. We have worked out a few examples for the committee's consideration, and they are also included in this package which has been distributed.

The lack of incentives for passive systems has had an impact on the number of installations in place today. Many potential users of active solar equipment deferred purchases until it was clear that Congress would adopt a National Energy Act with credits and other financial incentives for these systems.

Customers were also unsure as to whether these credits would be retroactive or if the tax credits would be refundable to purchasers with low tax liabilities. This unsettled situation had a negative impact on the growth of the solar industry.

The growth rate of this industry during the first 6 months of 1978 slowed to an estimated 13.6 percent, a 40-percent decline from the same period just 1 year earlier. The slump was especially damaging to the small pioneering solar companies which were dependent upon continued growth for survival.

At present there are an estimated 5,000 to 10,000 passively heated residential homes in the United States. The number of new residential homes built each year is now down to approximately between 1 and 1.5 million. Using an economic and market penetration model for passive solar homes, developed by the Los Alamos Scientific Laboratory, it is estimated that approximately 500,000 homes over the next 8 years will incorporate passive solar energy systems as a direct result of the passive tax credit proposed here.

It is further estimated that, in the period 1988–90, an additional 350,000 to 400,000 new homes will be built with passive solar energy systems as a direct result of changes in the building industry and the public demand for energy conservation in housing. These passive solar homes will require 30–80 percent less energy than a home of similar living characteristics without a passive solar energy system.

Corresponding fuel savings over the estimated 30-year life of the homes is 110 million barrels of oil equivalent for the passive homes built through 1988 as a direct result of the tax credit, and 180 million barrels for the total number of passive homes built through 1990.

In conclusion, we are pleased to add our support to the over 100 cosponsors of this bill. As you know, the Congress recently enacted, and the President signed into law, generous incentives for the development of solar energy, including establishment of the Solar Energy Bank.

We will closely monitor the respective impacts that the solar bank and tax credit will have on the development of passive solar technology with a goal of insuring the most cost-effective and efficient use of those incentives.

I would be pleased to answer questions that you may have.

[Attachments to the statement follow:]

HOW DOES THE PASSIVE RESIDENTIAL TAX CREDIT WORK?

Simple, Two Step Process:

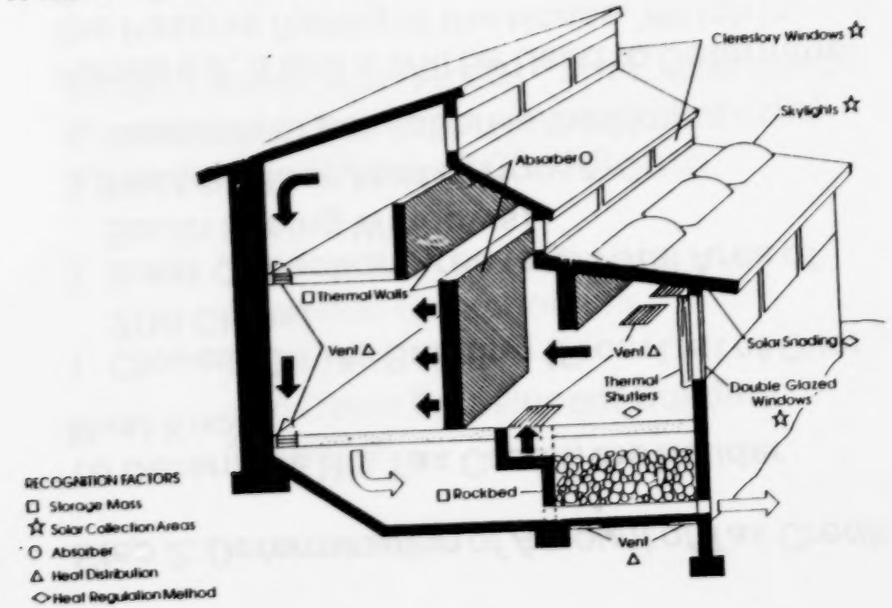
Step 1 Recognition Factor Form
Step 2 Determination of Amount of Tax Credit

Step 1. Recognition Factor Form

The Builder Will Complete a Simple Form Which Identifies the Requisite Passive Solar Components

- **Solar Collection Area (e.g. South Windows)**
- **Absorber**
- **Storage Mass**
- **Heat Distribution Method**
- **Heat Regulation Devices**

PASSIVE SOLAR HOME



Step 2. Determination of Amount of Tax Credit

To Determine His Tax Credit, the Builder Must Know

1. **Closest City to Building (From List of Over 200 Cities)**
2. **Solar Collection Area (e.g. Total Area of South Facing Windows)**
3. **Heated Floor Area of House**
4. **Amounts of Insulation in the House**

Factors 2, 3 and 4 Will be Used to Determine the Passive Rating of the House, Which in Turn Determines the Amount of Tax Credit

Solar Collection Area: "An Expanse of Transparent or Translucent Material That Faces Within 30° of South."

e.g. Windows
Attached Greenhouses
Skylights
and Other Translucent Building Surfaces

To Determine the House Heating Load:

The Builder Multiplies the Total Floor Area of the House by One of 8 Selected Insulation Factors Derived From the Insulation Factor Table and Adds to This the Area of South Glass times the Glass Factor.

House Heat Load =

(Insulation Factor x Floor Area) + (Glass Factor x South Glass Area)

Table of Insulation and Glass Factors

Building Type	Building Description	Insulation Factor
1	Uninsulated Single Glazed	0.60
2	Between 1 and 3	0.45
3	R-11 Walls (4 Inch Insulation) R-19 Ceilings (6 Inch Insulation) Uninsulated Basement Double Glazed Windows or Single Glazed With Night Insulation	0.30
4	R-11 and R-4 Walls (4 Inch Insulation + 1 Inch Polystyrene) R-30 Ceilings Uninsulated Basement Double Glazed Windows or Single Glazed With Night Insulation	0.25
5	R-19 Walls (6 Inch Insulation) R-30 Ceilings (9 Inch Insulation) Uninsulated Basement Double Glazed Windows or Single Glazed With Night Insulation	0.25
6	R-19 Walls (6 Inch Insulation) R-30 Ceilings (9 Inch Insulation) R-10 Basement/Slab (2 Inch Insulation) Triple Glazed Windows or Double Glazed With Night Insulation	0.20
7	R-24 Walls (6 Inch Insulation + 1 Inch Polystyrene) R-38 Ceilings (12 Inch Insulation) R-10 Basement/Slab (2 Inch Insulation) Triple Glazed Windows or Double Glazed With Night Insulation	0.18
8	R-30 Walls (9 Inch Insulation) R-60 Ceilings (18 Inch Insulation) R-20 Basement/Slab (6 Inch Insulation) Night Insulation on Windows	0.15

Glass Type	Description	Glass Factor
A	Single Glazed	1.10
B	Double Glazed	0.58
C	Triple Glazed	0.39
D	Single Glazed With Night Insulation	0.50
E	Double Glazed With Night Insulation	0.33

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The Builder Then

Determines the Passive Solar Rating by Dividing the Area of South Glass by the House Heating Load

$$\text{Passive Solar Rating} = \frac{\text{Area of South Glass}}{\text{Heating Load}}$$

The Builder Enters the Passive Rating in the Appropriate Column on the Solar Construction Credit Table and Finds the Nearest City

Solar Tax Credit Table

(Amount in Dollars)

Location	Passive Rating*									
	<.14	.14-.17	.18-.25	.26-.36	.37-.46	.47-.56	.57-.65	.66-.74	.75-.83	>.83
Albuquerque	0	261	792	1284	1608	1830	1980	2000	2000	2000
Atlanta	0	166	498	792	1032	1206	1338	1440	1512	1572
Boston	0	220	660	984	1284	1554	1794	2000	2000	2000
Burlington	0	262	786	1158	1488	1788	2000	2000	2000	2000
Dallas	0	146	438	696	864	972	1050	1104	1140	1164
Madison	0	278	834	1242	1602	1932	2000	2000	2000	2000
Sacramento	0	176	528	804	1008	1146	1242	1314	1362	1404

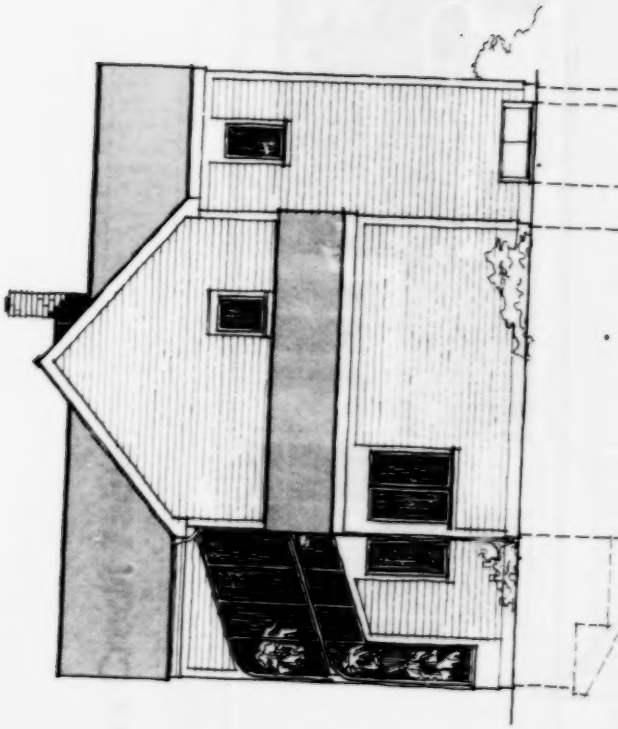
$$\text{*Passive Rating} = \frac{\text{Passive Solar Collection Area (Ft}^2\text{)}}{\text{House Heating Load (Btu's/°F-Hr)}}$$

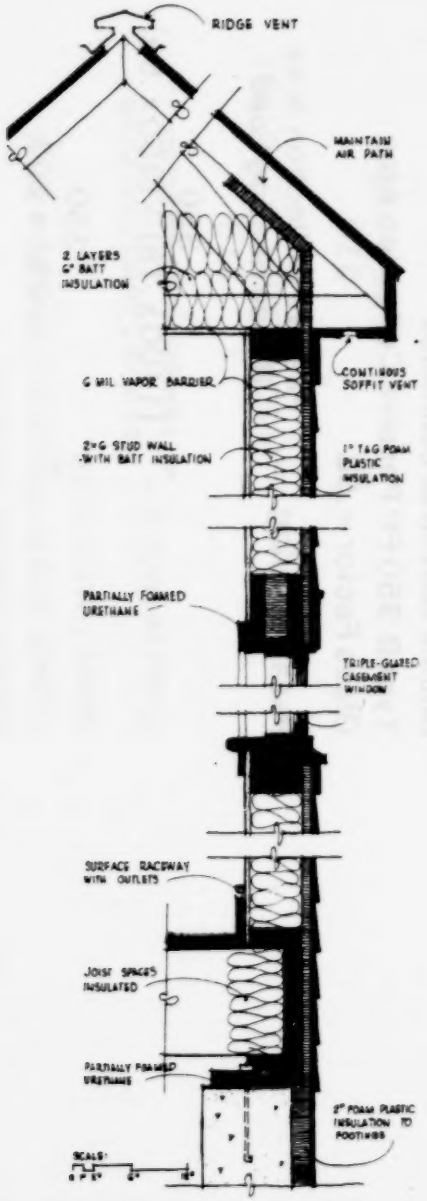
Solar Tax Credit Table.

(Amount in Dollars)

Location	Passive Rating*									
	<.14	.14-.17	.18-.25	.26-.36	.37-.46	.47-.56	.57-.65	.66-.74	.75-.83	>.83
Chicago	0	232	696	1044	1356	1638	1890	2000	2000	2000
Cleveland	0	202	606	888	1128	1344	1548	1728	1890	2000
Houston	0	102	306	462	558	618	654	678	696	708
Los Angeles	0	152	456	600	666	702	714	720	726	726
Medford, OR	0	216	648	1002	1290	1530	1722	1884	2000	2000
Nashville	0	168	504	774	1014	1212	1386	1524	1638	1734
Rochester, NY	0	210	630	912	1164	1380	1584	1770	1938	2000

$$\text{*Passive Rating} = \frac{\text{Passive Solar Collection Area } (Ft^2)}{\text{House Heating Load (Btu's/°F-Hr)}}$$





EAST ELEVATION

Insulation System Type7 1400 Ft² Home

Insulation Factor = .18
Double Glazed Greenhouse
TypeB 350 Ft² Passive Collection Area
Glass Factor = .58

$$\text{Passive Rating} = \frac{\text{Passive Collection Area}}{\text{House Heating Load}}$$

$$= \frac{350}{(1400 \times .18) + (350 \times .58)}$$

$$= \frac{350}{252 + 203}$$

$$= \frac{350}{453}$$

$$= .77$$

Insulation System Type4 1500 Ft² Home

Insulation Factor = .25
Double Glazed Windows
TypeB 279 Ft² Passive Collection Area
Glass Factor = .58

$$\text{Passive Rating} = \frac{\text{Passive Collection Area}}{\text{House Heating Load}}$$

$$= \frac{279}{(1500 \times .25) + (279 \times .58)}$$

$$= \frac{279}{375 + 162}$$

$$= \frac{279}{537}$$

$$= .52$$

Example

• House Location	Roseville, California
• Nearest Location	Sacramento
• Passive Collection Area	279 Ft^2
• House Heating Load*	465 Btu/Hr °F
• Passive Rating	279 = .52 537
• Tax Credit	$708

*House Heating Load = (1500 Ft^2 x .25) + (279 Ft^2 x .58)
From Insulation and Glass Factor Table
= 537 Btu/Hr °F

The CHAIRMAN. Mr. Schuldinger, did you want to make a statement at this point?

Mr. SCHULDINGER. I was wondering whether we could submit Mr. Lubick's statement for the record.

The CHAIRMAN. Without objection, the statement will appear in the record in full and you may make whatever comments you wish.

[Mr. Lubick's statement follows:]

STATEMENT OF HON. DONALD C. LUBICK, ASSISTANT SECRETARY (TAX POLICY), DEPARTMENT OF THE TREASURY

Mr. Chairman and members of the committee, I am pleased to have the opportunity to appear today to present the views of the Administration on H.R. 8019, H.R. 7688, and H.R. 7690, three identical bills to provide a tax credit to home builders for the construction of residences incorporating certain passive solar design and building techniques.

Under these bills, builders of new residential buildings with up to four residential units per structure which incorporate qualified passive solar energy systems will be eligible for a tax credit up to, but not exceeding, $2,000 per residential unit. The specific amount of the credit for a particular passive residence will be allocated on the basis of the energy saved as a direct result of the design and construction of the residence. This amount will be determined by the size of the passive solar system and the thermal efficiency (that is, ability to conserve energy) of the structure in which it operates. The full credit will be available for residences completed through 1985 phasing down to a $1,500 maximum in 1986, $1,000 in 1987 and $500 in 1988.

Current decisions made in the design of new residential structures will affect energy usage for many decades. It is therefore important to give an incentive to builders to design and construct residential structures which are energy efficient.

Passive solar systems have the potential to signficantly reduce the fossil fuel energy requirements of residential structures. Successful examples of passive solar residential structure have been demonstrated throughout a broad range of U.S. climatic regions resulting in reduction of energy consumption of from 30–80 percent.

A passive solar system maximizes the use of natural environmental forces for heating and cooling, in contrast to traditional conservation which stresses isolation from those environmental forces. In passive solar designs, energy is transferred to and from the structure by utilizing natural means (that is, conduction, convection, and radiation) with minimal dependence on mechanical equipment.

At the present time, residential builders have not undertaken the construction of homes with passive solar systems in any significant quantity. There are two fundamental reasons for this situation. First, builders are not familiar with passive solar technology and construction methods. Second, builders are unsure of the market for residences with passive solar systems. The purpose of the credit is to provide an incentive for builders to invest money to obtain a good passive solar design and to market passive residences incorporating these designs. The benefit to the homeowner will be reduced energy costs over the life of the residence. The benefit to the nation will be reduced consumption of fuel, particularly oil and natural gas.

As passive solar energy systems become more familiar to the building industry and the public, there is likely to be a growing demand for passive solar retrofit of existing homes. This could add significantly to the national energy savings induced directly and indirectly by the passive solar tax credit.

The determination of eligibility and the amount of a credit for a particular residence will be made through a two step procedure. The first step involves determining whether the system qualifies for the credit. The second step determines how much credit the builder can obtain. This process will be administratively simple to implement through the tax system.

A qualifying passive solar energy system must contain all of the following components in order to be eligible for the credit: (1) solar collection area; (2) absorber; (3) storage mass; (4) heat distribution system; and (5) heat regulation device.

Once it has been determined that the five "recognition factors" are present in the design of a structure, reference to a simple table will determine the amount of credit available for a particular structure containing the system. In order to use the table the builder must determine three basic facts, the area of the collection area (south-facing windows), the residence's heating load, and the nearest measuring city for which a table has been provided (over 250 are contemplated). The table presents pre-calculated amounts of credit based on the estimated amount of energy saved estimated as the difference between the non solar energy required to meet the heating load of the passive solar house and the non solar energy required to meet

the heating load of a reference house in the same location. The reference house is a house with 1,500 square feet of inhabitable area and a heating load of 7.5 Btu per square foot per heating degree day. The amount of tax credit which the builder receives will be approximately $60 per annual million Btu saved (before the phase-out).

This legislation is similar to the credit proposed by the Administration as part of the Crude Oil Windfall Profit Tax Act of 1980.

We believe that the credit is soundly conceived from a technical standpoint and support its adoption.

STATEMENT OF HON. DONALD C. LUBICK, ASSISTANT SECRETARY FOR TAX POLICY, DEPARTMENT OF THE TREASURY, ACCOMPANIED BY MOSHE SCHULDINGER, ATTORNEY ADVISER, OFFICE OF TAX LEGISLATIVE COUNCIL

Mr. SCHULDINGER. I would like to make one comment with respect to the provision of the credit that had raised questions as to its administrability when it was initially proposed.

I would like to support Dr. Stelson's comments with regard to the simplicity and workability of the proposal that is before the committee.

As he indicated, a qualified passive solar energy system need contain five components which are readily identifiable: First, the solar collection area, second is an absorber, the third is a storage mass, fourth, a heating distribution system, and fifth, a heating regulation device.

Once it has been determined that the five recognition factors are present in the design of a structure, reference to a simple table will determine the amount of credit available for a particular structure containing the system.

In order to use the table, the builder must determine three basic facts: The collection area, south-facing windows, the residence's heating load and the nearest measuring city for which a table has been provided. It is anticipated over 250 such cities will be available.

The table presents precalculated amounts of credit based on the estimated amount of energy saved estimated as the difference between the nonsolar energy required to meet the heating load of the passive solar house and the nonsolar energy required to meet the heating load of a reference house in the same location.

The reference house is a house with 1,500 square feet of inhabitable area and a heating load of 7.5 Btu per square foot per heating degree day. The amount of tax credit will be approximately $60 per annual million Btu's before the phaseout that is provided by this legislation.

This legislation is similar to the credit proposed by the administration as part of its proposals under the Crude Oil Windfall Profit Tax Act of 1980.

We believe the credit is soundly conceived from a technical standpoint and support its adoption.

The CHAIRMAN. Thank you very much.

Without objection, Mr. Secretary, your testimony will appear in full in the record.

Let me ask you first, is passive available at all as a retrofit?

Mr. STELSON. Absolutely; passive solar technology can be successfully incorporated into millions of present homes. Of course, not all residences would be suitable for retrofit due to original design

limitations or other problems, but millions of others could be successfully modified.

The CHAIRMAN. What benefits would be available either in this bill or in the solar bank?

Mr. STELSON. This is a builders' tax credit, so it would only be available to a builder who is building a passively designed residence.

The CHAIRMAN. And not a remodeled house?

Mr. STELSON. That is right.

The CHAIRMAN. It would have to be a new home?

Mr. STELSON. Yes.

The CHAIRMAN. What about the solar bank, is anything available there?

Mr. STELSON. The regulations are not fully developed yet, but I am advised by my colleagues that the solar bank will have provisions for passive retrofit.

The CHAIRMAN. Let's get on the record the situation as it relates to homes being built by individuals and not by builders, by individuals who contract out the construction of a home. What incentives do they have?

Mr. STELSON. If an individual, as defined by the bill, is the builder of a passively designed home, then he would have the same tax credits available to him as any other builder.

The CHAIRMAN. What do you mean, if he is the builder? Supposing an individual has a house designed and contracts it out to a builder, would this tax credit be available to him?

Mr. STELSON. In the law, the term "builder" means a person who is in the trade or business of building residential units and has a proprietary interest in the residential unit being built, so if——

The CHAIRMAN. If he were just doing it as a contractor, he would not have a proprietary interest and, therefore, he would not be eligible, is that right?

Mr. STELSON. As stated in the bill, I think that is correct.

Mr. FOWLER. If the Chairman will yield, we are going to have to pass my other bill.

The CHAIRMAN. Well, the committee will be looking at alternatives. We don't want to leave any gaps in this thing and want to make it as complete as possible.

Now, where does the solar bank come in on all of this? The solar bank is available to individuals who design and have their own houses constructed, is it not?

Mr. STELSON. That is correct.

The CHAIRMAN. And up to a $5,000 credit or subsidy?

Mr. STELSON. There are restrictions on the income conditions, and so on, of the applicants.

The CHAIRMAN. Do you know what they are?

Mr. STELSON. It is very complicated; let me get you an exact statement of those, and I will furnish it to the committee.

The CHAIRMAN. Without objection, that will be placed in the record.

[The information follows:]

HUD is presently in the process of developing the program plan and regulations on the implementation of the Solar Energy and Energy Conservation Bank. The comprehensive plan will be submitted to the Board of Directors and their agencies for review and comment. Unlike other entities, the Board of Directors of the Bank

will promulgate the regulations establishing criteria which determine eligibility requirements for subsidies and, therefore, until those are developed, I am not in a position to comment specifically on the various eligibility requirements that will be implemented by the Bank. HUD has indicated to the Department that they would have a draft of the program plan for us to review by the end of September 1980.

The CHAIRMAN. The problem that we have with direct subsidies is that they are encumbered by all kinds of prior applications, income limitations and other such restrictive devices that limit their use by the general public.

A tax credit is much more widely available or minimizes the redtape involved.

Mr. Fowler, I am interested in whatever bill we pass out of the committee being as broad as possible. I want to apply it to builders, and the formula we have in this bill, you think, is a workable formula as far as builders are concerned?.

Mr. STELSON. It is a simple, easily understood and easily applied system, so from our standpoint we think it is relatively simple and easy. We think this is very important because the building industry includes a large number of relatively small organizations and complex formulas that are difficult to follow, understand, and administer.

In our opinon, this is a simple, easily understood, easily administered system, but I do appreciate your comment about the breadth.

There are some restrictions, and we would favor having the fewest possible restrictions in line.

The CHAIRMAN. On the solar bank or the builders' tax credit?

Mr. STELSON. Right; the builder's tax credit.

The CHAIRMAN. Well, hopefully, in the course of these hearings we will get testimony on this other problem of making incentives available to individuals who design and build their own houses.

Yes, Mr. Schuldinger?

Mr. SCHULDINGER. I would like to supplement the comments of Dr. Stelson. This is in respect to what is available by way of tax credits for individuals.

Under the 1978 act, the solar credit does apply to individuals who use passive solar construction techniques, but it is limited in scope in that structural components which form a large portion of passive solar construction do not qualify. So to some extent individuals can qualify for credits for both retrofit and new construction under the 1978 act, and as you recall, Congress just increased the credit available for solar construction the crude oil windfall profit tax. But the credit is limited in scope.

The CHAIRMAN. Thank you.

Are there further questions, Mr. Fowler?

Mr. FOWLER. Mr. Chairman, just to continue for hopefully helpful clarification your line of questioning, Dr. Stelson, you were at Georgia Tech, were you not?

Mr. STELSON. Right.

Mr. FOWLER. Glad to have you at this end of the pipeline.

Mr. STELSON. Thank you.

Mr. FOWLER. We were told, back to the chairman's concerns, we were told that by making this credit available for new residential construction and attaching as we did an anti-double-dip provision on other Government subsidies, that we would free up the Solar

Conservation Bank to target additional money to aid retrofits; isn't that true?

Mr. STELSON. Yes; the regulations are not quite in place, so it is a little hard for me to give specific answers. They are being worked on very diligently right now, and I think that is absolutely true.

Mr. FOWLER. Well, the point is, and I appreciate it, is that the Department of Energy, Mr. Chairman, has been extraordinarily helpful in drafting this legislation in trying to cover all the bases to accomplish both the private incentives that we are trying to encourage, but also to fit it into our national energy policy efforts. Both of you did address one of the criticisms of the bill as to whether or not, the program would be administrable.

I was pleased to hear Mr. Schuldinger say that he called the proposal simple and workable and soundly conceived from a technical standpoint. That is the most specific encouragement that we have ever heard from the Treasury Department, I say to the good Assistant Secretary, Mr. Lubick.

Mr. LUBICK. You sound like a sponsor, Mr. Fowler.

Mr. FOWLER. It is so extraordinary to get such strong support for any legislation coming out of this committee from the Department of the Treasury, and I thought it ought to be heralded throughout the land.

Mr. LUBICK. We ought to savor it.

Mr. FOWLER. Address the other criticisms, and that is, go back to the basics. Is this legislation needed or would people go out and build solar systems anyway without subsidies?

Mr. LUBICK. Well, I think the Department of Energy people can help us on this. It is my understanding that this involves many new principles, and there is an innate conservatism. We think the stimulus that this would provide will enable this industry to get off the ground and you will notice that it is a "sunsetted" credit. We think that what is needed is a temporary stimulus.

Those principles will then be recognized as the sound way to go, and once we get acceptance, the need for the credit will then disappear. It will have proven itself as a desirable and energy efficient and appropriate way to go. So far we have not seen any great rush to adopt these principles and, therefore, it would appear that a stimulus is needed to start it.

Mr. FOWLER. Unlike the administration's original proposal, or the Senate version, I believe for that matter, the bill that I have sponsored with the chairman, Mr. Heftel, Mr. Pickle, Mr. Downey, and others contains a gradual phaseout of the tax credit rather than an abrupt termination.

We did this in part in response to a comment I received from Denis Hayes, of the Solar Energy Research Institute, in a letter to me of September 5 of last year. Let me quote.

He says:

> Although the provision of substantial tax credits will assist greatly the development of the solar energy industry, the abrupt elimination of those incentives may cause a significant short-term reduction in demand which would create problems for smaller companies in the solar industry. We suggest a phasing out of such credits.

We would think you would find that the better approach.

Mr. LUBICK. We would endorse that heartily. We approve of that principle very, very much.

Mr. FOWLER. Thank you; I see my time is up. I have a few extra comments on the chairman's concerns about an overall approach to this, but let me do that later and yield to my colleagues.

The CHAIRMAN. Are there further questions?

Mr. SCHULZE. Very briefly, Mr. Chairman, gentlemen, this legislation if you added a collector to your home—would you be eligible for the credit?

Mr. LUBICK. No.

Mr. SCHULZE. Do you feel that we should? I am thinking of the situation in the construction industry, where builders are having a hard time. It would seem to me to be a great potential market if we could create incentives for people to go out and sell solar devices. Even though it is only a $6,000 or $8,000 installation, it would be something that would be beneficial to our economy and also probably help the construction business during this tough period.

Mr. LUBICK. We think this credit is designed to accomplish a purpose which is to gain acceptance for passive solar units, and for them to work properly all five of those factors are essential to it.

Now, if we are going to aid the construction industry and the economy as a whole, the President does have a program which will do that very well.

Mr. SCHULZE. That is a matter of conjecture.

Mr. LUBICK. As far as encouraging the construction of passive solar residences, it is very important that we encourage them to be constructed in a complete and proper way and therefore we believe suggested that all five factors are essential.

Mr. SCHULZE. You are saying retrofitting cannot be done in a complete and proper way then?

Mr. LUBICK. That is essentially correct.

Mr. SCHULZE. Retrofitting would not help in the saving of energy?

Mr. STELSON. No; if I could attempt to answer that. I am unsure as to whether you were referring to an active system, but——

Mr. SCHULZE. No, passive systems.

Mr. STELSON. Under the solar bank, there would be benefits applicable for passive systems and certainly modification of existing homes. Retrofit, which includes increasing the solar gain, storage and so on is highly desirable, very cost effective, and extremely appropriate for the homeowner.

The big problem faced by this bill, though, is getting builders to construct new homes that are different from the homes they have built in the past. That has the greatest potential and the greatest long-term benefits and requires a change in the design and marketing systems.

Mr. SCHULZE. I am not knocking that aim but when you say the greatest potential benefit, if we could retrofit every home in the country with a passive solar device that was in a position to utilize it, that would be of great immediate benefit to the country.

Mr. STELSON. Most homes can be successfully retrofitted, but generaly it is quite difficult to retrofit them to equal the energy saving that can be realized from a passively designed new structure.

Mr. SCHULZE. Granted, but we don't want to just give up on that, do we? We want to encourage that just as much as this new construction?

Mr. STELSON. Absolutely.

Mr. SCHULZE. Do we have a cost figure on this bill, any idea what the cost would be?

Mr. LUBICK. For the period, Mr. Schulze, the revenue estimate is approximately $500 million.

Mr. SCHULZE. How much would it be if we included the retrofit?

Mr. LUBICK. We can try to get that for you. We don't have a revenue estimate on that.

Mr. SCHULZE. I would doubt if it would add very much to the revenue impact. Your position on the tax credit is so much less, the amount would be so much less.

Mr. LUBICK. This is a credit for the builders, of course. Are you talking about a builders' credit for retrofit, presumably not?

Mr. SCHULZE. If you went either way, if you gave the credit to the builder, I am sure it would be passed on in the price of the job so it doesn't make an awful lot of difference one way or the other.

Mr. LUBICK We will submit something to you for the record.

Mr. SCHULZE. It surprises me that it has been left out. There is a tremendous potential there and it would be extremely beneficial to the construction industry today. In fact, yesterday, all summer.

Thank you, Mr. Chairman.

Mr. FOWLER. Would the gentleman yield?.

Mr. SCHULZE. Certainly.

Mr. FOWLER. This is the Joint Committee on Taxation's estimate on the bill now before the committee.

A reduction in budget receipts of $6 million in fiscal year 1981, $122 million in 1982, $40 million in 1983, $63 million in 1984, and $365 million in fiscal years 1985 through 1989, which is in line with Treasury's estimate.

As the gentleman knows, I do have another bill that would give a credit to the homeowner for retrofitting.

Mr. SCHULZE. Wouldn't there be a way that that could be combined with this and not necessarily go to the homeowner. Maybe there are some who would do it themselves but you are opening a great market for builders, and those who are specializing in solar, if they were to go in and put the greenhouse set up on homes that are situated on a site which would be amenable to it.

Mr. FOWLER. Absolutely. That is what I would like to see.

Mr. SCHULZE. It would be a great potential savings in energy immediately, within the next 6 to 9 months.

As those figures reflect, we are going to start benefitting from this in the out years to a much greater degree than we are now, and it seems to me by the addition of this credit for retrofitting, we could have a larger immediate benefit all the way around.

Thank you, Mr. Chairman.

The CHAIRMAN. Are there further questions, Mr. Frenzel?

Mr. FRENZEL. Mr. Chairman, I would like to thank the panel for its presentation today and ask any of them who would want to comment about a couple of the objections we had when this proposal was last before the committee.

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At that time the committee worried greatly about the lack of specificity in the description of passive solar devices. It also worried a little bit about the fact that as in a number of other tax credits and deductions there was the possibility that this tax credit would simply give someone a prize for something he or she was going to do anyway. The cost of any kind of a house in this day and age is a pretty expensive adventure.

There is a fair amount of incentive for people in certain areas, in certain income groups to build these devices and systems into the house anyway. Therefore, is this doing any good?

I would like somebody or anybody to comment on both of those problems that we saw last time.

The first is, how do we know what a solar device is, and how does the average person know what it is and, second, does it do any good?

Mr. STELSON. It is true, because a passive system incorporates many of the normal elements of a home, plus some special adaptations of these elements and new elements as well. It is less identifiable than an active solar system.

But, as knowledge about passive designs and systems has developed and as we have several thousand now in place and operating, I think we now have a relatively simple method for identifying passive systems and the contribution an individual system makes to the energy conditions of the home, which is, does it perform?

So the method evaluates both the design and the performance of the system in a simple way that I think is very clear-cut and specific rather than ambiguous.

With respect to your second comment, questioning whether a passive solar tax credit is just a prize that we would give to somebody who would otherwise incorporate passive solar anyhow, for some time it has been clear that a passive system is an inexpensive, cost-effective way of designing a home that greatly reduces energy consumption.

The adaption has been relatively small, and there are somewhere between 5,000 and 10,000 passive homes in the country, depending on the definition.

Mr. FRENZEL. You have me worried. I thought you had the definition locked up tight.

Mr. STELSON. We do, but some would modify it.

Mr. FRENZEL. I am certain Mr. Lubick has it down pat.

Mr. STELSON. If you enlarge the windows on the south side, in one sense you have contributed somewhat to a passive solar system. It would not qualify under this bill, so this bill would greatly sharpen the definition of a psssive system. We have not had such a sharp definition in the past.

But it is our best estimate that the primary gain from this would be a substantial acceleration. I have no doubt that passive solar residences are going to be enormously successful in the future, but it is much to the country's benefit and to the people's benefit to move ahead faster in adaptation. That is what this bill would do.

Mr. SCHULZE. Would the gentleman yield?

The CHAIRMAN. I yield to the gentleman.

Mr. SCHULZE. If a passive collector of the greenhouse type was put on a house that included a solar collection area, an absorber

which could be a brick floor or wall, that storage mass, heat distribution method which would be fans to push it through and heat regulation devices which would have thermostatic controls on that fan, why would that not conform to those five basic elements?

Mr. STELSON. If it had the five basic elements, it would be a passive system as designed by this bill.

Under the retrofit arrangement, of course, originally we had proposed and recommended that passive retrofit be treated exactly as active retrofit, that there be the tax credit to the individual in the same way that there is with active solar systems.

Unfortunately, that did not come to pass. This bill deals with a different problem, and that is a problem of getting builders on board and moving, getting the construction techniques in place to do this, but your comment is a good one. There is this whole other area of passive retrofit which would be of enormous benefit to the country.

Mr. SCHULZE. I also believe if we could encourage retrofit you are going to broaden the market acceptance for the new solar homes. If somebody sees their neighbor retrofit a home and cut their heating costs by 40 or 50 percent, they are going to know that it really works; it is good and it is acceptable, and when they buy a home they are going to look for that kind of feature.

Mr. LUBICK. Existing law does allow a credit for retrofit if it is not part of the structure, if it is separable—up to $4,000 out of a $10,000 investment—so there is already some provision for the retrofit in the existing residential credit which could be useful in a great number of cases.

Mr. SCHULZE. You say that is up to $4,000?

Mr. LUBICK. Up to 40 percent of $10,000.

Mr. SCHULZE. For a greenhouse-type collector?

Mr. STELSON. A greenhouse-type collector would probably not qualify, or at least most of it, since it would not be part of the structural elements of the residence.

Mr. SCHULZE. Thank you.

Mr. FRENZEL. Mr. Chairman, my time has expired. I continue in my reservations about giving a tax credit for a structure that is built facing the right way with a certain number of windows in it. I am not, satisfied with the five criteria.

I would appreciate it if any member of the panel would elucidate for the record in stronger terms if they really have a definition here that makes sense.

The CHAIRMAN. Mr. Heftel?

Mr. HEFTEL. Thank you, Mr. Chairman.

I want to share with my colleagues all of my enthusiasm for the support and contribution, leadership and inspiration that the Treasury Department has provided for this proposed legislation.

I wonder if we could focus in again on what Mr. Schultze was alluding to about the retrofitting? We have a $500 million revenue factor that you have already projected.

Do you have an energy savings figure that goes with that?

Mr. STELSON. Yes. Through 1990, which would be just shortly after the phaseout of the incentive, 180 million barrels of oil.

Mr. HEFTEL. That is the total for the whole period?

Mr. STELSON. As time goes on, the savings will climb dramatically because these homes would be in use and would be saving energy, so the ultimate savings of these homes would be very much more than that.

Mr. HEFTEL. I am wondering, if you could project the energy savings in the last year of the program which would be a much better measuring tool?

Mr. STELSON. We have a complete phasing function.

Mr. HEFTEL. The reason I was posing the question this way was to return to Mr. Schulze's point with regard to the retrofitting. If we had a simplified, very encouraging kind of program for retrofitting, where we weren't trying to complicate it, but simplify it, where we were not worried about getting ripped off, but assuming nobody was going to rip you off because you would get what you wanted—energy savings.

Do you have comparable figures on what we could save in energy if we had a comparable, simplified program to encourage retrofitting by the individual? So that we could start to compare these two? Would it be easy for you to put that together for us?

Mr. STELSON. Yes; it would be. We would be delighted to do that.

Mr. HEFTEL. Because I think when we see what we can save through the retrofitting, in fuel, then we can start to get a focus on whether or not that should be a part of this legislation if in the next 10 years that is where the real savings could occur.

Mr. STELSON. We would be glad to do that.

[The following was subsequently received:]

Attached chart reflects the energy savings that could be realized upon enactment of a tax credit for passive solar retrofit of existing structures.

TAX CREDIT FOR PASSIVE SOLAR RESIDENTIAL RETROFIT CONSTRUCTION

This proposal would provide a tax credit to home improvement (retrofit) builders/contractors of homes which incorporate passive solar features.

The credit applies to homes completed between 1980 and 1989. The maximum allowable credit is $2,000 for units completed from 1980 to 1985. For residential units completed after 1985, the maximum will be phased down in accordance with the following table:

Units completed in:	*Maximum*
1986	$1,500
1987	1,000
1988	500

Estimated Federal cost for the builders' retrofit tax credit through 1985 are as follows (duplicates costs of new home credit):

	Millions
1980	$4.1
1981	10.2
1982	21.7
1983	39.5
1984	63.6
1985	93.9
1986	83.7
1987	69.7
1988	37.2
Total	423.0

The following assumptions have been made.

The average credit will be $1,000 (maximum credit is $2,000) through 1985, then will decline to $900 in 1986, $750 in 1987 and $400 in 1988.

Year	Amount of average credit	No. of credits	Cumulative credits
1980	1,000	4,100	4,100
1981	1,000	10,200	14,300
1982	1,000	21,700	36,000
1983	1,000	39,500	75,500
1984	1,000	63,600	139,100
1985	1,000	93,900	233,000
1986	900	93,000	326,000
1987	750	93,000	419,000
1988	400	93,000	512,000

The credit will represent an average of 20 percent subsidy for residential passive systems.

Year	Federal cost (millions)	Private cost (millions)	Total cost (millions)
1980	$4.1	$16.4	$20.5
1981	10.2	40.8	51.0
1982	21.7	86.8	108.5
1983	39.5	158.0	197.5
1984	63.6	254.4	318.0
1985	93.9	375.6	409.5
1986	83.7	334.8	418.5
1987	69.7	278.8	348.5
1988	37.2	148.8	186.0
Total	423.0	1,694 4	2,117.4

Assuming each house taking advantage of the credit provides a 25 percent solar fraction, approximately 4 bbl oil equivalent will be saved per house per year. Direct energy savings resulting directly from the passive builders tax credit:

Year built	Savings per year (barrels)	Savings by 2000 (barrels)
1980	17,000	600,000
1981	41,000	1,500,000
1982	87,000	3,100,000
1983	158,000	5,000,000
1984	255,000	8,100,000
1985	375,000	11,000,000
1986	372,000	10,200,000
1987	372,000	9,500,000
1988	372,000	8,500,000
Total		57,500,000

Calculating the Federal costs of energy saved directly through the builder's retrofit tax credit yield a cost to the government of $15.00 per barrel. Participants ultimately have a cost of nearly $60.00 per barrel.

CUMULATIVE ENERGY SAVINGS
1980-2000 DUE TO CREDIT

Mr. LUBICK. There are severe difficulties, Mr. Heftel, in the retrofit area, in particular along the lines Mr. Frenzel suggested of distinguishing between a roof that is built for structural purposes as whether it is passive solar, or whether it is just the roof that was going to be built in any event.

I think the difficulties arise, when you get into the retrofit area, in the structural area. If it is apart from the structure, we have already provided for it in the residential credit. Those difficulties are quite horrendous.

That is one of the reasons we made that distinction between structural and nonstructural.

Mr. HEFTEL. I understand the motive in doing that, and the position you have taken and I think it is quite reasonable. But if our objective is to benefit from the technology and the savings of energy, I think we can say that what we are doing now is not significantly achieving that objective.

Finally, there is no danger that we'll be providing a credit for activity that could occur even without the credit.

I don't think that we have to worry about people doing something they are going to do anyway because at the present time they are simply not doing it.

The facts speak for themselves. Our problem is not to protect ourselves from those abusing the possibility, but to encourage those to use the possibility which has simply not been taken advantage of by either the homebuilder or the individual in terms of retrofitting or building their own home.

Mr. STELSON. Right.

Mr. HEFTEL. Thank you, Mr. Chairman.

Mr. SCHULZE. Will the gentleman yield for one brief question?

Mr. HEFTEL. Certainly.

Mr. SCHULZE. Mr. Lubick, I presume these are static figures, the $500 million?

Mr. LUBICK. Yes. Our revenue estimates on individual matters are always that way.

Mr. SCHULZE. It would seem to me this money is being expended. People are paying tax on it. We are talking about a very small amount of money compared to the benefit to the economy and to the country. It seems to me if we err and are a little too generous, we can always correct it later on.

This is something which could have a dramatic effect on the energy situation. If we are going to err, let's err on the side of doing too much. I agree with the gentleman.

Mr. HEFTEL. Thank you very much. Thank you.

The CHAIRMAN. Thank you very much. Are there further questions?

If not, we appreciate very much your testimony.

Our next witness is William F. Willis, General Manager, Tennessee Valley Authority.

Mr. Willis, welcome to the committee.

STATEMENT OF WILLIAM F. WILLIS, GENERAL MANAGER, TENNESSEE VALLEY AUTHORITY, ON BEHALF OF S. DAVID FREEMAN, CHAIRMAN, TVA, ACCOMPANIED BY JAMES T. GALLAGHER, MANAGER, NEW SOLAR HOMES PROJECTS, OFFICE OF POWER, TVA

The CHAIRMAN. Without objection, your full statement and supplemental materials will be included in the record.

Mr. WILLIS. Thank you.

The CHAIRMAN. If you would introduce your colleague, we would be happy to hear you.

Mr. WILLIS. Thank you, Mr. Chairman.

It is a pleasure to be here. I have with me James Gallagher, manager of our Solar Homes Projects at TVA.

I would like to apologize to the committee for Chairman David Freeman being unable to attend this morning.

He contracted influenza over the weekend. I would like to read a statement in his behalf.

Mr. Chairman, I appreciate this opportunity to provide the committee with TVA's experience on the significance of passive solar residential technology as an inexpensive and renewable source of energy and to lend support to this legislation.

As you may know, President Carter recently challenged the Tennessee Valley Authority to become the Nation's solar showcase and we have responded to his challenge to provide leadership.

Under TVA design sponsorship, 50 passive solar homes will be in place throughout the valley by next spring. Already 40 of them are either completed or under construction, capable of demonstrating to the people of our region the significant energy-saving advantages of the Sun.

I have a booklet of the project that I have provided. I brought along a model that you may wish to see later. Three have already been sold and are now occupied.

In addition, TVA is helping manufacturers develop 130 prefabricated homes which feature passive solar heating and cooling.

The first of these modular homes came off the line at a Tennessee plant last week and will be sited at a new development in Knoxville this Wednesday.

Mr. Chairman, solar home construction is no fad in the Tennessee Valley. It is a practical technology whose time has come. Our experience with these demonstration homes proves without a doubt that they are, indeed, cost effective.

Prototype construction shows homes with passive solar heating cost 3 to 5 percent more than conventional homes. A TVA passive solar home costs about $56,500 or $34.15 per square foot in the typical 1,655 square foot home, as demonstrated in the model we brought along today.

Conventional homes cost $32.50 per square foot to build. Solar homes thus cost $1.65 a square foot more. But the payoff is in the energy savings—7,850 kilowatt hours per year, producing a savings to each occupant of $306 a year based on current electric rates of 3.9 cents per kWh. Assuming increases in electric rates of 9 percent a year, the passive solar design would pay for itself in 7 years.

Consider another example of the impact of passive solar improvements: A greenhouse can be built in the TVA area for $4 to $30 per

square foot—the costs vary greatly depending on whether or not a custom design is used, the source of labor and the quality of materials used.

The greenhouse could result in annual savings of 16 to 28 kWh per square foot. Thus a typical 200-square-foot greenhouse at an average cost of $18 per square foot could result in an annual savings as high as 5,600 kWh, or $218 per year at current TVA electric rates.

Assuming increases in electric rates of 9 percent per year, the greenhouse would pay for itself in 10.5 years. Homeowners also gain the additional financial benefits of increased home values and potential for food production.

The technology for passive solar is not new or complicated—it represents little more than common sense.

Earlier societies found it desirable to incorporate similar features into their dwellings to use natural energy to improve their comfort.

The availability of cheap fossil fuels in the 20th century gave us the luxury of moving away from passive building practices. In fact, we built glass houses in which the fossil-fueled air-conditioner fought a losing battle with the Sun.

As we all know, that era is rapidly drawing to a close. It is clearly in the national interest to reduce our dependence on nonrenewable fuel sources to assure our energy self-sufficiency. We must once again take common sense passive principles into account in our buildings.

Passive homes do not require radical departures from contemporary building practices. The homes can be built using typical building materials. Experienced contractors and manufacturers have not encountered major problems in following the plans and specifications of TVA's passive designs. The homes' appearances can either be modernistic or traditional, depending on the wishes of the buyer.

The vast numbers of existing homes also offer tremendous potential for energy savings through passive solar improvements. Indeed, the residential conservation service provision of the National Energy Conservation Policy Act recognizes the importance of energy reduction in existing homes.

RCS specifically requires utilities to audit existing homes to determine, among other considerations, the potential for solar improvements.

TVA has been working with architects and the real estate industry to provide detailed information on passive solar. We have sponsored workshops throughout the valley for builders, realtors, and appraisers on the design of passive solar homes.

We evaluate new plans for solar designs submitted by builders and architects in the valley, and the TVA solar homes now going up across the valley are all TVA-designed. These and related activities are financed exclusively with power system revenues because we have determined this to be a cost-effective investment.

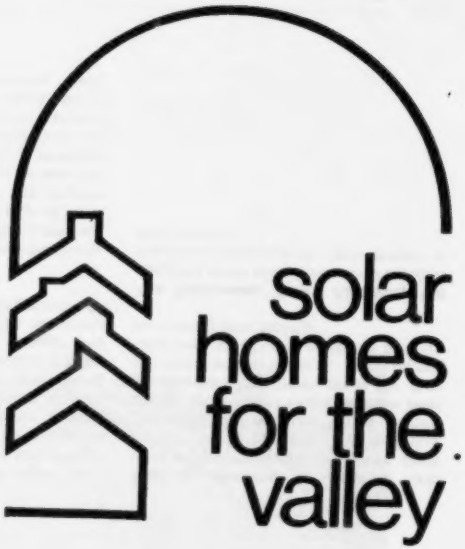
The problem, Mr. Chairman, is that despite these efforts which show that passive solar homes are cost effective over their life, the builders have little incentive to spend the extra money for them.

Unfortunately, passive solar is not well known to the general public.

I believe that financial incentives comparable to those available for active solar units are essential to get this technology started. Our experience clearly shows that it is a worthwhile investment that can make significant inroads into our need for expensive, nonrenewable energy resources.

I would be glad to answer any questions the committee may have.

[An attachment to the statement follows:]



1979 Design Portfolio

Tennessee Valley Authority
Solar Applications Branch
Architectural Design Branch

Solar Homes for the Valley

This brochure describes the eleven solar home designs which have been developed by the Solar Applications Branch and the Architectural Design Branch of the Tennessee Valley Authority.

All eleven single family dwellings are designed to be heated and cooled passively. Passive systems use energy naturally. They allow energy transfer to occur through radiation, conduction, and natural convection. These houses employ several passive elements to achieve thermal comfort throughout the year.

In the winter, it is necessary to collect and store heat within the dwelling. The collector may be a window, greenhouse, skylight, or a glass covering over a thermal storage wall. The storage wall, or Trombe wall, provides the mass necessary to effectively hold the heat until it is needed at night. Other storage elements include water tubes, water drums, floor slabs, and interior masonry walls.

The eleven houses described here employ all of these collection and storage methods. In addition, all of the homes are designed to minimize summer cooling loads. Overhangs and shading devices eliminate direct gain through south-facing glass, and openings are designed to maximize natural ventilation through the spaces. All of the houses are extremely well insulated, with R-30 ceilings and R-19 walls.

Each house has its own character. Ranging in size from 1000 to 2000 square feet, the dwellings meet a wide range of housing needs. Optional decks and carports are available on most of the homes. Site requirements allow a variety of lot slopes and orientations, and planting notes are written to aid the passive performance of the houses with strategic placement of evergreen and leaf bearing plant materials.

Back-up systems for extremely cold days and extended periods of cloud cover should be determined by individual life styles and budgets. Wood burning stoves and efficient fireplaces have been incorporated into these plans for their economy and efficiency. Heat pumps have been specified as additional back-up for heating and cooling.

The Tennessee Valley Authority has designed these solar homes in the public interest to encourage the development of solar housing.

solar homes for the valley

Solar House 1

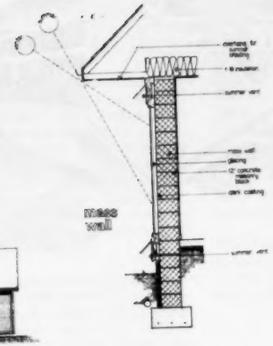
solar homes for the valley

Solar House 1 is a single level plan with a total of 1210 square feet. The plan has the option of being a 2- or 3-bedroom house. There is also a lengthened version of House 1 in which the plan is expanded to enlarge the bedrooms. The total square footage on the expanded plan is 1408 square feet. A carport on the front and deck on the east side of the house are optional.

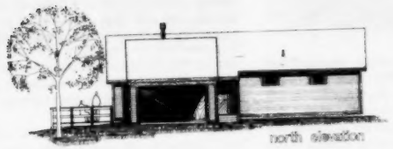
Site Requirements include a flat to gently sloping lot with driveway access on the north, east, or west. The main house entry is on the north.

Passive Solar heating is achieved with a Trombe wall and direct gain.

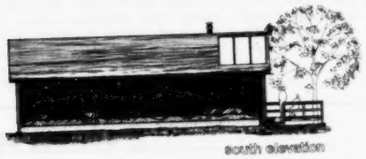
west elevation



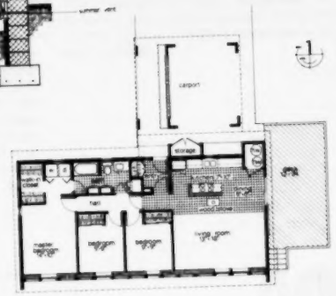
mass wall



north elevation



south elevation



floor plan

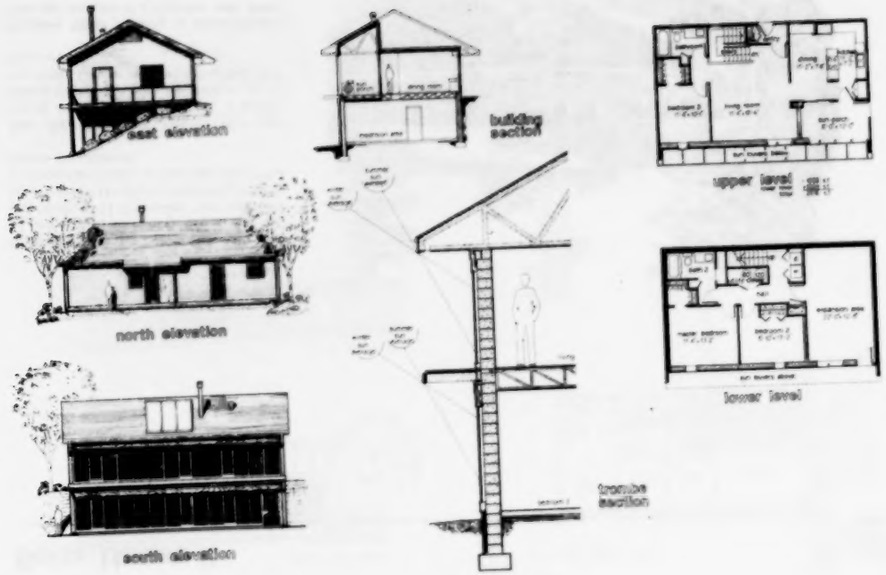
Solar House 2

solar homes for the valley

Solar House 2 is a 2-level plan with 1008 square feet on each level. 676 square feet are finished on the lower level with 332 square feet available for future expansion. A carport and deck on the east side of the house are optional.

Site Requirements restrict that this house be built specifically on a south-facing sloped site with the main entry on the north. Driveway approach is also from the north.

Passive Solar heating is accomplished through the use of a Trombe wall, direct gain, and a sunporch. Earth integration tempers the house.



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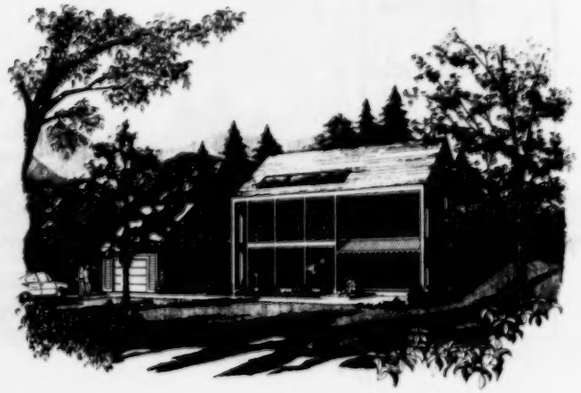
Solar House 3

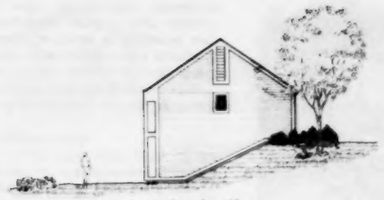
solar homes for the valley

Solar House 3 is a 2-level plan with 792 square feet on each level. In addition, there is a two-story solar atrium of 196 square feet. The house has an optional attached garage, for a total size of 2116 square feet.

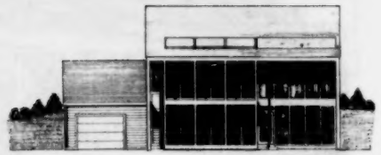
Site Requirements include a south-facing sloped lot with driveway approach from the south. The main entry of the house is on the south.

Passive Solar heating occurs by means of a Trombe wall and solar atrium. Skylights in the atrium provide direct gain. Water tubes provide heat storage in this space. The house is tempered with earth integration, and a high ceiling/summer vent combination enhances ventilation.

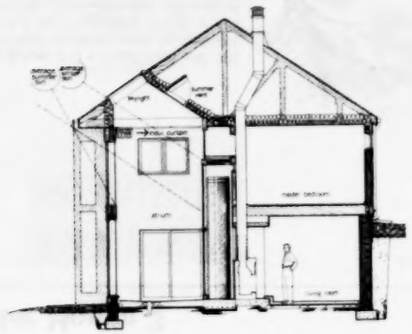




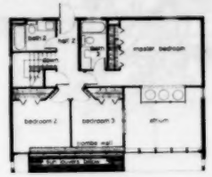
east elevation



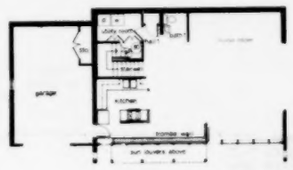
south elevation



building section



upper level



lower level

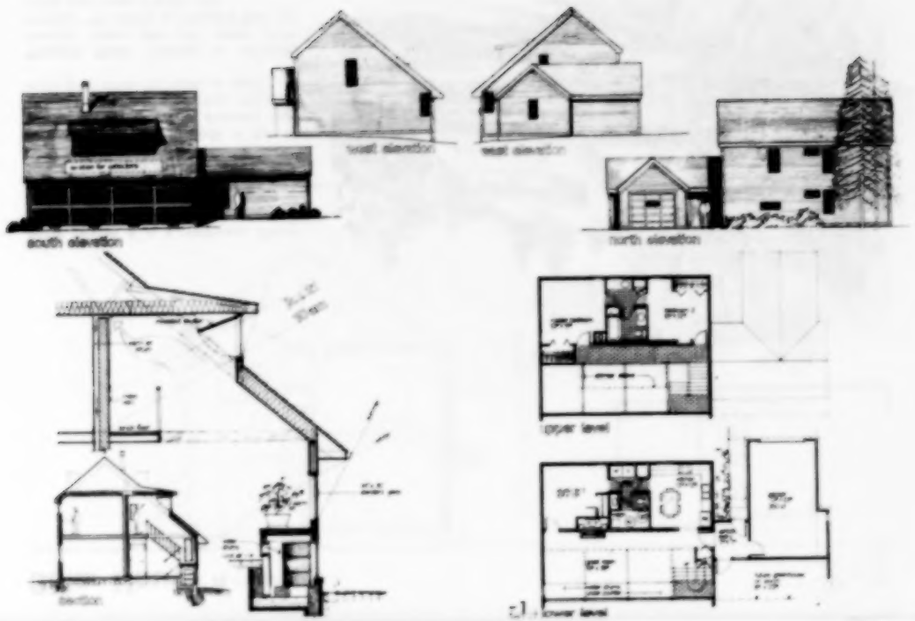
Solar House 4

solar homes for the valley

Solar House 4 is a traditional 2-level saltbox of 1578 square feet. An attached one-car garage completes the house at 1953 square feet. There is a location for a future greenhouse addition.

Site Requirements include a flat to gently sloping lot. The driveway may approach from any orientation, and main entry is on either the north or south.

Passive Solar heating is achieved through direct gain and water drum storage. The drums are isolated from the living area under a brick shelf.



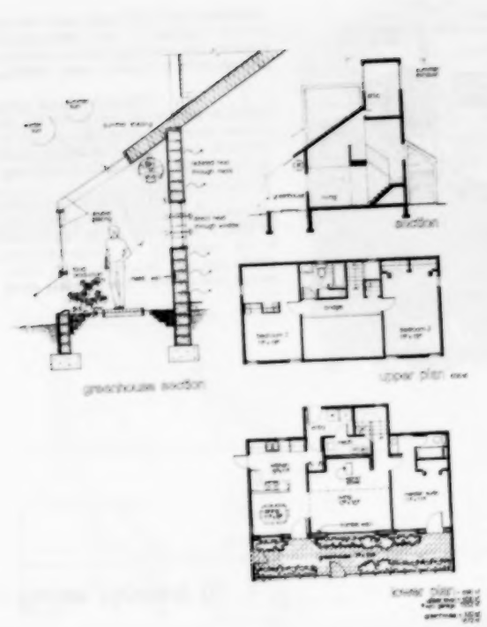
Solar House 5

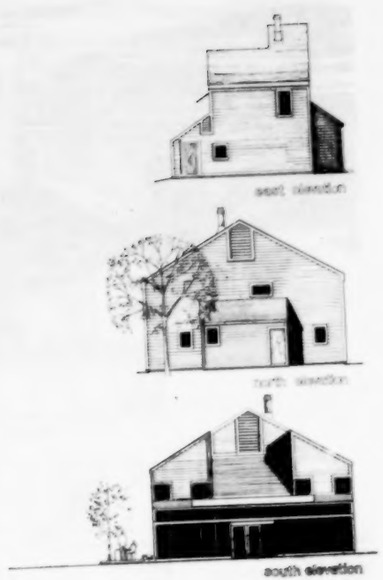
solar homes for the valley

Solar House 5 is a contemporary 2-level house for a rural setting. The 1562 square foot dwelling is enhanced by a greenhouse on the south for a total of 1872 square feet. A carport and deck are offered as options.

Site Requirements include a flat to gently sloping lot with driveway approach on the north or south. The main entry is on the south, but an optional split-level north entry is available.

Passive Solar heating is accomplished through the use of the attached sunspace (greenhouse) with a masonry thermal storage wall. Direct gain is also employed.





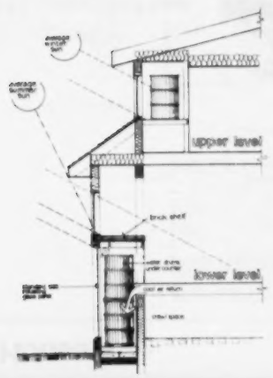
Solar House 6

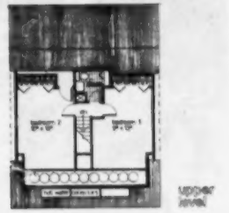
solar homes for the valley

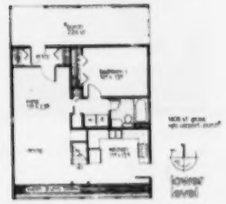
Solar House 6 is a compact 2-level house of 1406 square feet. The dwelling was designed to allow the framing to be constructed of rough-sawn lumber, in order to reduce costs. A carport is optional.

Site Requirements include a flat to gently sloping site with driveway access on either the north or south. Main entry occurs on the north side of the house, through an attached porch.

Passive Solar heating is achieved through direct gain with water drum storage.







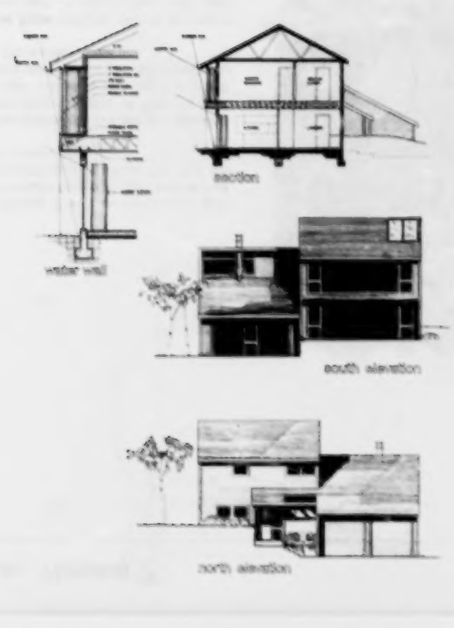
Solar House 7

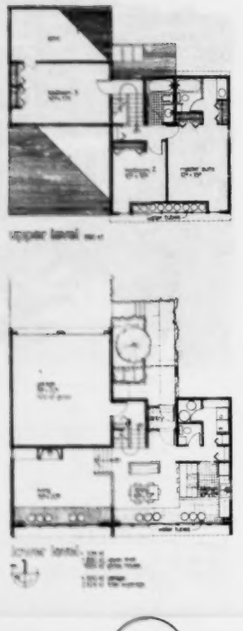
solar homes for the valley

Solar House 7 is a contemporary split-level suburban house of 1824 square feet. The attached garage brings the total size to 2324 square feet.

Site Requirements will allow a site sloping from east to west, or west to east, with main house entry on the north. Driveway access and garage orientation are to the north.

Passive Solar heating occurs by means of direct gain in conjunction with clear fiberglass reinforced water storage tubes.





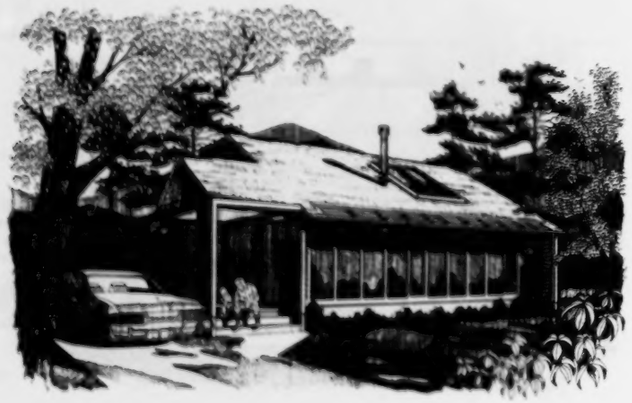
Solar House 8

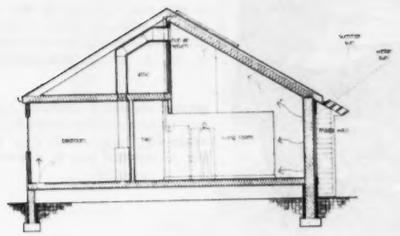
solar homes for the valley

Solar House 8 is the smallest of the eleven, at 1003 square feet. The single level dwelling has an optional carport. It is an excellent compact house for a small family.

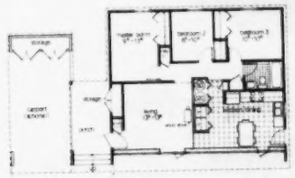
Site Requirements include a flat to gently sloping lot with driveway approach on the north or south. Principle entry to the house may be on either the east or west.

Passive Solar heating is furnished by means of a Trombe wall.



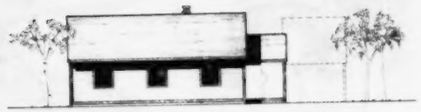


section



floor plan

west elevation



north elevation

south elevation

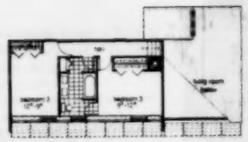
Solar House 9

solar homes for the valley

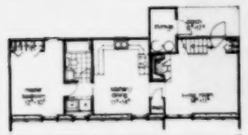
Solar House 9 is a traditional 2-level farmhouse of 1235 square feet. A more spacious 1406 square foot plan is available. Both plans have a porch entry.

Site Requirements include a flat to gently sloping lot with driveway approach from any orientation. Main entry is gained from the north.

Passive Solar heating is accomplished with a Trombe wall.

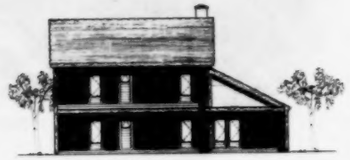


upper level

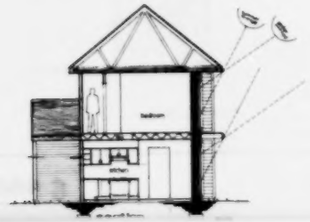


lower level

west elevation



south elevation



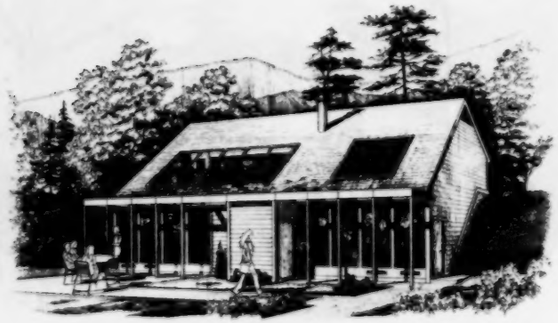
solar homes for the valley

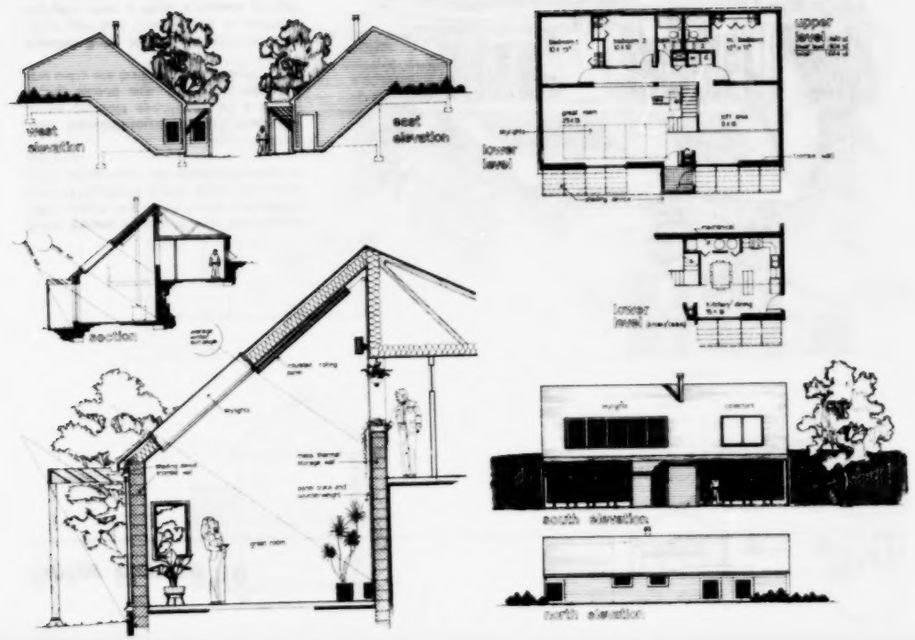
Solar House 10

Solar House 10 is a bi-level dwelling of 1664 square feet. This house provides a light atmosphere which belies its partial earth integration. An attached garage is optional.

Site Requirements restrict that this house be built specifically on a south-facing sloped site. Driveway approach and entry are both from the south.

Passive Solar Heating is achieved with direct gain and Trombe wall. In addition, skylights over a large sunspace provide solar gain for an interior masonry wall.





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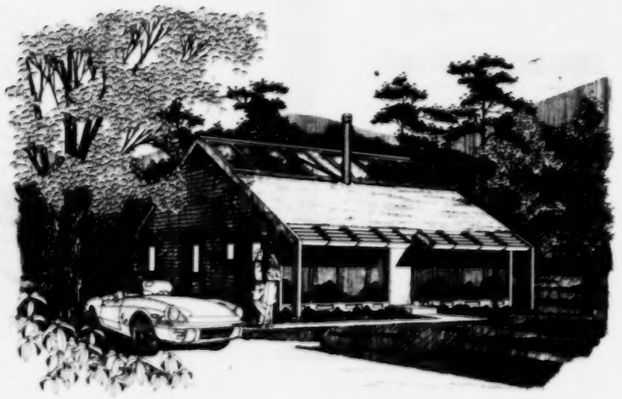
Solar House 11

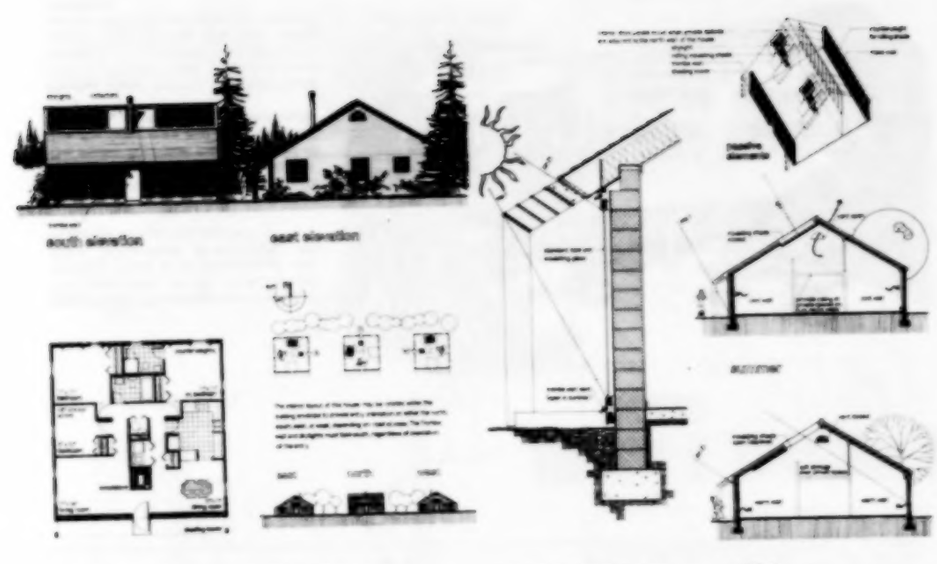
solar homes for the valley

Solar House 11 is a small gable house of 1210 square feet. Its size, shape, and site flexibility make it an exceptional candidate for multiple development. The house has an optional carshed.

Site Requirements allow the house to be built on a flat to gently sloping lot, with driveway approach from any orientation. The square floor plan may be rotated so that the living area and main entry will always be on the street side of the house.

Passive Solar heating is accomplished with a Trombe wall. Skylights in a cathedral ceiling provide direct gain for an interior masonry wall. The high ceiling works with summer vents to enhance ventilation.





Notes

Additional solar house designs are being prepared in cooperation with regional architects, builders and developers, and will be added to the TVA design portfolio.

The eleven house designs described in this brochure are currently being constructed by private builders in cooperation with local housing development agencies. After the designs have been built and verified this winter, construction drawings, specifications and owners manuals for each house design will be made available to the general public at a minimal cost.

These houses are designed for use in the TVA climatic region ONLY, and may not be appropriate for other climatic regions.

If these designs are considered for construction outside of the Tennessee Valley they should be reviewed by a professional familiar with passive technology.

TVA makes no statement, representation, claim or warranty with respect to these plans and specifications.

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632-4100 (Knoxville area)

The CHAIRMAN. Thank you.

How does the Tennessee Valley Authority actually assist in the building of these homes?

Mr. WILLIS. The program we have, Mr. Chairman, is that we provide front-end money for a group of public agencies to be our sponsor to contract for building of the homes. We have designed them and we have worked with the architects and the builders to demonstrate how the homes can be built and the materials used.

We work with the development agencies and groups like this around the valley in the seven States that we operate in, and they act as a sponsor, a go-between, to contract with a local builder to build the home and sell it.

Now, the money from the sale of the home is returned to TVA to offset the cost of the program.

That is the basic route that we use. We have one other program a modular home construction program with the modular home industry, where we put up some front-end money to demonstrate how similar lines of modular manufacturing facilities can convert to build passive solar modular homes.

We have a program of 130 of these under way right now and will demonstrate to the low-income homeowner how he can benefit from this program.

The CHAIRMAN. I certainly want to commend you, Mr. Willis, and the authority, for your far-sightedness in this matter.

Mr. Duncan.

Mr. DUNCAN. I would like to welcome Mr. Willis, my home town friend, to the committee.

The resources for the financing of the solar showcase, where does that come from?

Mr. WILLIS. Mr. Duncan, the funds for the 44 homes we have are power funds.

Mr. DUNCAN. In other words, the people of the valley, the electrical consumers, are paying for that?

Mr. WILLIS. Yes.

Mr. DUNCAN. Don't you think because the President has asked this to be the Nation's solar showcase that perhaps the Department of Energy should help finance this project instead of just the consumers of the valley?

Mr. WILLIS. Yes, sir, we certainly do. That is the reason we enthusiastically support this legislation.

The program that we have is a starter program. The funds will come back to the authority after the homes are sold. The costs that we have involved in the startup, have been calculated to be a benefit to the system that will be repaid.

Mr. DUNCAN. A great number of people think that the power revenues come from funds appropriated by Congress, which is wrong. It comes from the consumers.

In addition to solar, I think the President also has called upon TVA for other energy initiatives.

Is that also coming from the consumers of the valley instead of the Nation?

Mr. WILLIS. No, sir. Most of the others that show no direct benefit to the ratepayers of our power system are financed through appropriations.

Mr. DUNCAN. Most of your research though comes from the local people, is that right?

Mr. WILLIS. Yes, sir. Most of our research and demonstration projects for the future of the power system does come from the current rate base.

Mr. DUNCAN. Are you using revenue funds from the consumers of the Valley in demonstration projects or research in other areas outside of the Tennessee Valley designated area?

Mr. WILLIS. No, sir, I don't know of any outside the Tennessee Valley area.

Mr. DUNCAN. I understood you were perhaps doing some in Indiana or elsewhere.

Mr. WILLIS. I am not aware of that. If we are, I would be glad to supply it for the record.

Mr. DUNCAN. I do want to thank you. It is something that has always bothered me, that the Tennessee Valley Authority would use revenues from the consumers. I think you are in agreement that the Department of Energy should at least contribute their portion of the costs for research, particularly in the solar energy area. Otherwise it will be borne by the consumers whose electric bills now are almost prohibitive.

I think this is one thing that you and the administration and the Congress should really pursue and let the Nation pay its share instead of the poor consumers of the valley.

Mr. WILLIS. Yes, sir, we certainly agree with you.

Mr. DUNCAN. Thank you. You are doing an excellent job.

The CHAIRMAN. Are there further questions?

Thank you very much, Mr. Willis. We appreciate your testimony.

Without objection we will place in the record a prepared statement by our colleague, Congressman Pickle, who is unable to be with us this morning.

[The prepared statement follows:]

STATEMENT OF HON J. J. PICKLE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

While I regret that I cannot be at the hearing Monday morning, I am quite pleased our committee is considering H.R. 7688. Chairman Ullman deserves our thanks for realizing the importance of passive solar energy and calling this hearing.

I have been telling reporters and other folks in my district that passive solar energy is an idea whose time is coming. I said that because the conference on the windfall profits tax did not include the credit earlier this year. And it appeared no action was forthcoming on H.R. 7688 this session.

But because of this hearing, because of renewed attention for passive solar and because of potential energy savings, I would now say that passive solar is an idea whose time is here, right now.

The support for this bill is encouraging. Anytime you can get homebuilders and solar enthusiasts touting the same thing, you know something positive is going on!

This support indicates that folks who would use the credit feel it is workable. The passive credit, added to existing credits for active solar and insulation, can move this country a giant step forward in reducing our dependency upon foreign oil.

There are some people in this country who are blazing the trail in conservation techniques. This tax credit would open the trail up for more people at a crucial time. So I wholeheartedly support H.R. 7688.

The CHAIRMAN. Mr. Heftel, would you like to testify before the committee?

STATEMENT OF HON. CECIL (CEC) HEFTEL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF HAWAII

Mr. HEFTEL. No. I ask unanimous consent to place my statement in the record and would like to take this opportunity to thank you for your leadership in holding these hearings and in joining with Mr. Fowler, Mr. Downey, myself and the 100 or so members who have now cosponsored the legislation.

The CHAIRMAN. I thank the gentleman.

Without objection, his statement will appear in the record.

[The prepared statement follows:]

STATEMENT OF HON. CECIL (CEC) HEFTEL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF HAWAII

It gives me a great deal of pleasure to be here this morning to speak on behalf of H.R. 8019, H.R. 7688 and H.R. 7690, legislation to provide tax credits to encourage builders to include passive solar energy systems in new homes. I am pleased to have been an original sponsor of this legislation with my distinguished colleague from Georgia, Mr. Folwer. I would also like to point out that this proposal is cosponsored by over 100 Members of the House including several distinguished members of this Committee including our Chairman, Mr. Ullman, Mr. Pickle, Mr. Downey, Mr. Duncan and Mr. Guarini. Finally, I would also like to take this opportunity to congratulate Senator Hart of Colorado for his tireless efforts as the prime sponsor of this legislation in the Senate. Though the time is short in this Congress, I remain hopeful that we can act on an acceptable passive solar package this year.

Mr. Chairman, it is my feeling that the passive solar legislation which we are considering today would accomplish two major goals. First, it would give a needed boost to the housing industry to include passive solar systems in new construction at a very modest cost to the Federal Government over the eight year duration of the program. The current recession has not only reduced new housing starts nationwide but it has also seriously hampered the ability of builders to incorporate passive solar in the housing which is started. The second major benefit to be derived from this proposal is quite obvioulsy in the energy savings which we will realize by including passive solar systems as part of the original design of homes. Since the Nation's entire housing stock is expected to be replaced over the course of the next fifty years, it is vitally important that new housing incorporate passive solar systems (as well as other energy-efficiency features) if future generations are not to be "locked-in" to increasingly costly and uncertain supplies of energy for their residential needs.

The major obstacle facing passive solar is that builders and developers are increasingly constrained by today's inflationary economy, and therefore, inhibited from making any addition to a home which will increase its costs. The benefits of passive solar accrue to the homeowner rather than the developer over the life of the home. Consequently, there is a need to provide an incentive to builders to proceed with passive solar construction in new housing. The benefit to the builder will be an improved climate for passive investment. The benefit to the homeowner will be reduced energy costs over the life of the residence. The benefit to the Nation will be reduced consumption of fuel—particularly, oil and natural gas.

Mr. Chairman, the legislation before us today would provide a tax credit to builders and developers for residential passive solar systems based on their effectiveness in reducing the standard heating and cooling load on a home, rather than providing a credit for a percentage of the cost of all the components of the passive solar system (many of which might serve dual functions).

To qualify for the credit, a passive solar system will have to possess all of the following elements which are strictly defined in the legislation: A solar collection area, an absorber, a heat storage mass, a heat distribution mechanism, and heat regulation devices. The amount of the credit for a given passive solar system would be determined by analyzing through a series of simple calculations the energy efficiency of the given passive house in a particular location.

The maximum credit for a passive solar system under this proposal would be $2,000. It is expected that the credit for an average system would be about $1,000, constituting about a 20 percent subsidy for residential passive solar systems. The program would be phased out by the end of 1988.

Mr. Chairman, our Nation must make every effort to encourage the use of currently available alternative energy systems. It is my feeling that passive solar can make a contribution to our Nation's energy needs in the near term if we give

the homebuilding industry the financial boost that it needs to get these systems off the drawing boards and into new housing construction.

Mr. Chairman, I would like to take this opportunity to congratulate you for your leadership in sponsoring this legislation and for bringing the matter of passive solar to the Committee's attention. I hope that we will be able to work together in the days ahead with our House and Senate colleagues in fashioning a passive solar program which will give a needed boost to our Nation's housing industry and allow us to take one more step down the road to energy independence.

Thank you very much.

The CHAIRMAN. Mr. Fowler.

STATEMENT OF HON. WYCHE FOWLER, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF GEORGIA

Mr. FOWLER. Mr. Chairman, I want to echo the tanks to you from my colleague from Hawaii for your expeditious scheduling of these hearings and for your own bill to encourage the adoption of a passive solar tax credit.

I also would like to, with the Chair's permission, submit a statement for the record.

The CHAIRMAN. Without objection, your statement will appear in the record.

Mr. FOWLER. I would just take a couple of minutes to make some suggestions growing out of this morning's session raised primarily by my colleagues, and that is I fervently hope we can find a way to combine this bill with some relief for individual homeowners who are not affected by this legislation and who do choose to retrofit and install some form of passive solar system.

As you know, in the Senate this bill has been sponsored by Senator Hart. Last year his amendment for a passive credit for builders passed by a very large majority.

I think there was only one dissenting vote, but for some reason it was dropped by the House/Senate conference.

Senator Hart's legislation, like my bill, sets up a two-step process. The recognition list and the table.

If we came up with what I guess I will call, for lack of a better definition, a hybrid credit, it could be, might I suggest for future discussion, in one of at least two forms.

In the first, the homeowner resident, could be required to identify that he is making an addition to the structure that is a passive system. He could ue the five recognition factors that we have in our bill to determine this. A credit would then be given against the cost of the addition as long as it is part of the passive system.

This method would be consistent with the original language in the Senate bill, S. 3919, which provides that solar property which is structural should receive a credit against its additional cost; that is, the difference between the cost of the solar property and its nonsolar components.

Since the taxpayer would have to identify the addition as part of a passive system in order to be eligible for the credit, it seems to me that the IRS would be protected from any sort of con artist who is trying to count a home improvement as a passive system.

The fact that the taxpayer is making an addition to an existing structure should insure that the definitional problem would be avoided.

The second option, Mr. Chairman, would be to require the taxpayer to use the recognition list and the table to determine the level of credit available.

This would mean the taxpayer must find out what the heat loss is for his building in order to calculate the solar fraction of his system.

The Residential Conservation Service has been established to provide energy audits of existing homes which will provide a heat loss factor in Btu's per square foot.

This could be plugged right into the calculation.

The second option would provide a residential taxpayer with the same level of credit available to builders. This would mean that passive retrofits would still be at a disadvantage compared to active systems. Active systems are eligible for a 40-percent credit, and the passive credit would be based on an upper limit of 20 percent on average. This imbalance may not be a real problem, as passive systems, particularly solariums or sun spaces, are far less costly than their active space heating counterparts.

The first option would allow the homeowner/renter to be eligible for the 40 percent renewable energy credit contained in the windfall profit tax bill. Concern that builders would choose not to take a credit for a passive system so a prospective buyer could take advantage of a larger credit could be allayed, in may opinion, by limiting the retrofit credit to homes in existence by September 30, 1980, which is the date used in H.R. 7688.

So, Mr. Chairman, I think that we have an opportunity to do what I think all of us sponsors and those are not sponsors at present want to do to meet some of the concerns raised by Mr. Archer, Mr. Frenzel and others. We ought to be able to find a way to merge the credits so that we could encourage new home building technology with passive solar and work on our national energy problems by having the credit to the builder or the developer, but also find a way to encourage the resident, the homeowner, in some modest way to help him if he chooses to retrofit, save energy costs in the future.

I again thank the chairman for his time devoted to the subject and yield back the balance of my time.

[The prepared statement follows:]

STATEMENT OF HON. WYCHE FOWLER, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF GEORGIA

Mr. Chairman and distinguished colleagues, I am extremely pleased to appear before you today as the sponsor of H.R. 7688, a bill to provide an energy performance based tax credit to builders who incorporate passive solar energy systems in new homes.

This legislation has won widespread support within Congress and within the private sector. As of today, we have 103 co-sponsors in the House, including, from this Committee Congressmen Pickle, Downey, Duncan, Guarini and Chairman Ullman in addition to Congressman Heftel and myself. The other body approved a similar measure sponsored by Senator Hart last December by a vote of 82 to 1.

Among the groups which have endorsed the passive solar tax credit for builders are: the National Association of Home Builders, the American Institute of Architects, the National Conference of State Legislatures, the National League of Cities, the League of Women Voters, the Sierra Club, the Bricklayers International Union, the Solar Lobby, Environmental Action, the National Concrete Masonry Association, the Passive Solar Products Association, the Friends of the Earth, the Brick Institute of America, the National Wildlife Federation, the International Masonry Institute, the Environmental Policy Center, Pittsburgh Plate Glass, the National

Woodwork Manufacturers Association, the Solar Energy Industries Association, and the Mason Contractors Association.

Clearly, there is a broad and growing awareness that passive solar energy can make an important contribution toward reducing our nation's energy problem. As Modesto Maidique, author of the solar energy section of the Harvard Business School's acclaimed report, Energy Future, wrote to me last September 11: "Passive solar design is the most desirable of all the solar technologies and should be strongly encouraged."

A well-designed passive solar energy system can produce energy savings of up to 80 percent of a standard home's conventional hearing load. When one multiplies this by the over a million new houses constructed annually, it is obvious that these passive systems represent a tremendous potential for conserving conventional energy resources. A 1979 study prepared for the White House concluded that by the year 2000, passive solar could contribute one quad, the energy-equivalent of 180 million barrels of oil per year, of the nation's energy needs.

But this potential will not be realized as fully or as quickly as is possible, or as the country needs, without positive action by the federal government. For many years we have subsidized the production and consumption of fossil fuels through special tax treatment, federally funded research and development, and most recently federal price controls. Even though these policies have been or are in the process of being revised in light of new circumstances, they have created biases within our economic system against energy conservation or unconventional energy resources.

What we propose in the legislation before the committee today is to provide a partial offset against these past policies in order to let a promising new technology take root.

The approach we have chosen, namely a tax credit to the builders of passive homes, grew out of our experience with the Energy Tax Act of 1978. In that legislation the Congress recognized the desirability of assisting the purchase of both active and passive solar energy systems by providing a tax credit to the homeowner who installed such systems. However, as the legislation has been interpreted, it bars credits for passive solar systems which serve a dual function; and, since many of the major passive features, such as specially designed eaves, Trombe walls, and south-facing windows, are of necessity structural components as well, current law excludes the vast majority of passive solar energy systems.

When it became apparent that the 1978 Energy Tax Act was not going to provide the intended spur to passive solar, a number of individuals in both the Executive and Legislative branches began to search for an alternative method to stimulate the adoption of passive solar techniques. What emerged from this effort, involving especially input from the Departments of Energy and Treasury and the Internal Revenue Service, was the decision to provide the credit to the builder rather than the homebuyer and to spell out in detail how the credit would be determined rather than allowing for discretionary determination by the IRS.

Making the credit available to the homebuilder targets the assistance to the key decision-maker in the building process.

A primary reason why passive systems, which would result in substantial life-cycle cost and energy savings, are not being built in large numbers today is that residential buyers are extremely sensitive to changes in the cost and availability of credit and hence give maximum consideration to the first cost of a home. Builders are certainly aware of this and must give priority to cutting first costs to a minimum.

The $2,000 maximum credit under HR 7688 would represent a significant offset for the higher initial costs of a passive home and therefore is a substantial incentive for the construction of passive systems.

In summing up the Treasury Department's reaction to the passive tax credit, Don Lubick said in a letter to Senator Hart: "We believe that the proposed credit would provide builders a worthwhile incentive to incorporate passive solar energy designs in new construction. We are satisfied as well that the proposal is both administrable for the Internal Revenue Service and workable for the builders who would claim the credit."

Despite recent improvements in our energy conservation efforts we still are faced with an unacceptably high foreign oil bill of over $90 billion a year and over 40 percent reliance on interruptible overseas sources of supply. For both economic and national security reasons, we cannot afford to "let nature take its course" in moving our country toward a more energy efficient future, but we must pursue public policies to speed this transition. In my opinion, the passive solar tax credit, which would utilize the private sector rather than governmental bureaucracy, represents one of the most cost-effective ways of achieving energy self-sufficiency.

Finally, I would like to stress to the committee the importance of moving this legislation this year. For each month that we delay 100,000 new homes, homes that on average will be a part of our housing stock and a consumer of our energy resources for the next 30 years, will be constructed. We must not let this opportunity to improve our energy security for decades to come slip away.

The CHAIRMAN. I thank the gentleman.

Are there further questions?

If not, thank you, Mr. Fowler.

Our next panel will be, representing the National Association of Home builders, Mr. Robert Peterson, immediate past chairman of the energy committee, accompanied by Robert Shepherd, director of regulatory affairs, and Michael Bell, assistant director of technical services department; Steven Winter Associates, represented by Steven Winter; Ducker Research Co., represented by Scott Kennedy.

Without objection, each of your statements and supplemental materials will be included in the record in full.

We would be very pleased to hear you. We welcome you to the committee.

STATEMENT OF ROBERT PETERSON, ON BEHALF OF THE NATIONAL ASSOCIATION OF HOME BUILDERS, ACCOMPANIED BY ROBERT SHEPHERD AND MICHAEL BELL

Mr. PETERSON. I am Robert Peterson, a homebuilder from Lincoln, Nebr., testifying today on behalf of the more than 125,000 members of the National Association of Homebuilders.

Mr. Shepherd and Mr. Bell and I appreciate the opportunity to be here today to present our views on legislation to provide a tax credit to homebuilders for the construction of residences incorporating passive solar design and building techniques. In order to stay within the time period, I will skip over a few parts of the prepared testimony.

As a homebuilder who builds passive solar homes, and as the immediate past chairman of the NAHB Energy Committee, I believe I can speak to the merits of the proposed legislation with accuracy.

NAHB strongly supports the bills of the committee that would provide a tax credit to builders that construct passive solar homes. Our support for such an incentive comes after careful consideration of both active and passive solar systems and how they can be adapted to residential construction.

We believe that a passive solar design is the most cost effective use of the Sun's energy.

Although experience with passive solar homes is good, it is nonetheless limited. Only a small percentage of builders are presently building passive solar homes because it is an additional and somewhat unknown risk.

Especially in today's housing market, very few builders want to take the additional risk of building a passive solar home which will cost more than a conventional home and may not sell.

An upfront tax credit to the builder will lessen the additional risk of building a passive solar home.

Second, the passive solar tax credit legislation before the committee provides a simple and workable definition of a passive solar system. Hesitancy in the past to support previous solar tax credits

by the IRS and homebuilders hinged upon the vague definition of "passive system."

A definition based on the cost of components gets bogged down in separating the costs of the components' structural versus energy purposes.

The performance-based definition for this credit has been endorsed by NAHB and the IRS because it is simple and it can work. The definition insures a sound passive design, is very easy to work with, and is something that is understandable to the builders.

Third, the performance-based credit also encourages the construction of a well-insulated home. Since the amount of the credit increases in relation to the entire homes' ability to save energy, builders are encouraged to build tighter, more energy-efficient homes. At the same time, the credit discourages building a passive system that would cause overheating in the home and increase the cooling load.

Mr. Chairman, let me state at this time that the tax credit approach to encouraging the construction of more passive solar homes is the most preferable incentive according to builders across the country.

It is necessary to get the builder and developer committed to passive solar early in the development process. Passive solar homes obviously require proper orientation to take best advantage of the natural heating. This in many instances will require changes in lot size or tract layout.

For passive features to be most efficiently incorporated, it is advantageous for the ridge of the roof to have an east-west orientation, so the front or the back of the house can face south. However, reorientation of the house on the lot to improve solar access increases the required width and, therefore, the cost of the lot.

The builder, in order to make these types of adjustments in the development process, needs to know the incentive is there during the development stages. Subsidized loans can aid future homebuyers in buying solar homes, but not if these types of homes are not being built.

Since the tax credit is directly awarded to the builder, he can market the passive solar homes at a more competitive price than without it, thereby stimulating consumer interest.

In a recent survey of builders across the country, conducted by the NAHB Research Foundation, over 80 percent of those responding to the survey indicated that a tax credit would encourage them to use more passive solar techniques in homes they build.

Another advantage of the passive solar tax credit is that it would spur more production of passive solar products. Currently few passive solar products exist simply because there is little demand for these products.

The increase of construction of passive solar homes would in turn create a demand for passive solar products. This in turn will increase competition and jobs in this area. The only barrier is a lack of a market.

We believe the credit would have a very positive ripple effect for the passive solar industry. As the passive solar industry expands, passive solar techniques, systems and products will improve and

costs will decrease, making the payback for such systems even shorter.

Today, passive solar homes are being introduced primarily in custom-built, high-priced homes on larger lots where added cost is less of a problem and where more advantageous orientation on lots can be achieved.

But with the adoption of the tax credit, the small-volume builders with less capital to risk would consider the use of passive solar in their homes. This would make more passive homes available in the lower price range of the market.

A tax credit is the kind of incentive that would attract both large-scale and small-volume builders to the passive solar market.

There has been some comment by opponents of the bill that there is no need for a passive solar tax credit for builders, due to the existence of the solar bank. The bank is available for the consumer to reduce the mortgage on that part of the loan that pertains to the passive solar costs.

The bank will not be of much use if there are no passive solar homes being built. It will take a long time for consumer demand, only utilizing the bank, to increase the number of builders building passive solar houses. We feel that the direct credit, which can be no more than $2,000, will be a quicker method of getting more passive solar houses built.

We also think that even though the tax credit will not be a major drain on the tax revenues, it should continue only until it stimulates the growth of widescale passive solar construction.

Once builders begin to construct passive solar homes and homeowners realize their tremendous energy saving potential, passive construction will become standard in areas where it is beneficial, thereby eliminating the continued need for a tax credit.

In summary, we feel that the passive solar tax credit for builders is the most cost-effective and efficient way to insure the construction of energy-efficient homes because it would expedite passive solar construction; the performance method is workable and understandable for all builders; the performance-based credit encourages construction of well-insulated homes; it is the method builders prefer by over a 2-to-1 ratio and, therefore, would encourage increased passive solar construction; and it is a more cost-effective use of Federal funds than the solar bank.

Thank you for giving me the opportunity to present our views for you today. Mr. Chairman, I will be pleased to answer any questions which you or your distinguished committee may have.

[The prepared statement follows:]

STATEMENT OF THE NATIONAL ASSOCIATION OF HOME BUILDERS

My name is Robert Peterson and I am a homebuilder from Lincoln, Nebraska. I am testifying today on behalf of the more than 125,000 members of the National Association of Home Builders (NAHB). Accompanying me today are Robert Shepherd, Director of Regulatory Affairs and Michael Bell, Assistant Director of the Technical Services Department of NAHB. We appreciate the opportunity to appear here today to present our views on legislation to provide a tax credit to home builders for the construction of residences incorporating passive solar design and building techniques. As a homebuilder who builds passive solar homes and as the immediate past chairman of the NAHB Energy Committee, I believe I can speak to the merits of the proposed legislation with accuracy.

NAHB strongly supports the bills before the Committee that would provide a tax credit to builders that construct passive solar homes. Our support for such an

incentive comes after careful consideration of both active and passive solar systems and how they can be adapted to residential construction. We believe that a passive solar design is the most cost effective use of the sun's energy. A tax credit for a builder that incorporates a passive solar design is a needed incentive to spur such construction. I would like to explain some of the reasons we feel a tax credit is the most workable incentive to increase the number of passive solar homes.

First, although experiences with passive solar homes is good, it is nonetheless limited. Only 15 percent of the builders are building passive solar homes because it is an additional and somewhat unknown risk. Especially in today's depressed housing market, very few builders want to take the additional risk of building a passive solar home which will cost more than a conventional home, and may not sell. Because both builders and consumers are unaware of the cost effective benefits, passive solar homes are not in great demand at this time. An up front tax credit to the builder will lessen the additional risk of building a passive solar home.

Secondly, the passive solar tax credit legislation before the Committee provides a simple and workable definition of a passive solar system. Hesitancy in the past to support previous passive solar tax credits by the IRS and homebuilders hinged upon the vague definition of "passive system." A definition based on the cost of components gets bogged down in separating the costs of the components' structural versus energy purposes. The performance based definition for this credit has been endorsed by NAHB and the IRS because it is simple and it can work. The definition ensures a sound passive design, is very easy to work with and is something that is understandable to the builders.

Thirdly, the performance based credit also encourages the construction of a well insulated home. Since the amount of the credit increases in relation to the entire homes' ability to save energy, builders are encouraged to build tighter more energy efficient homes. At the same time the credit discourages building a passive system that would cause overheating in the home and increase the cooling load.

Mr. Chairman let me state at this time that the tax credit approach to encouraging the construction of more passive solar homes is the most preferable incentive according to builders across the country. It is necessary to get the builder and developer committed to passive solar early in the development process. Passive solar homes obviously require proper orientation to take best advantage of the natural heating. This in many instances will require changes in lot size or tract layout. For passive features to be most efficiently incorporated, it is advantageous for the ridge of the roof to have an east/west orientation, so the front or the back of the house can face south. However, reorientation of the house on the lot to improve solar access increases the required width and, therefore, the cost of the lot. The builder, in order to make these types of adjustments, in the development process, needs to know the incentive is there during the development stages. Subsidized loans can aid future homebuyers in buying solar homes but not if these types of homes are not being built.

Since the tax credit is directly awarded to the builder, he can market the passive solar homes at a more competitive price than without it, thereby stimulating consumer interest.

In a recent survey of builders across the country, conducted by the NAHB Research Foundation, over 80 percent of those responding to the survey indicated that a tax credit would encourage them to use more passive solar techniques in homes they build. I myself, build passive solar homes but I find the demand is not great. In order for passive solar to become more widespread in use, people need to see such homes in their area. When people can be assured that a passive solar home will not look unusual, they will be more interested and feel more comfortable about living in one. In order for that to happen, besides consumer awareness of what a passive solar home is, builders' attitudes will also have to change. As the builder perceives the market increasing and the risk factor taken away by the credit, he will be more willing to experiment with passive solar.

Another advantage of the passive solar tax credit is that it would spur more production of passive solar products. Currently few passive solar products exist simply because there is little demand for these products. The increase of construction of passive solar homes would in turn create a demand for passive solar products. This in turn will increase competition and jobs in this area. The only barrier is a lack of a market. We believe the credit would have a very positive ripple effect for the passive solar industry. As the passive solar industry expands, passive solar techniques, systems and products will improve and costs will decrease making the payback for such systems even shorter.

Today, passive solar homes are being introduced primarily in custom built, high priced homes on larger lots where added cost is less of a problem and where more advantageous orientation on lots can be achieved. But with the adoption of the tax

credit, the small volume builders with less capital to risk would consider the use of passive solar in their homes. This would make more passive homes available in the lower price range of the market. We also believe that some leading large volume builders and developers would enter the passive solar market if sufficient incentives are available. A tax credit is the kind of incentive that would attract both large scale and small volume builders to the passive solar market.

There has been some comment by opponents of the bill that there is no need for a passive solar tax credit for builders, due to the existence of the solar bank. The bank is available for the consumer to reduce the mortgage on that part of the loan that pertains to the passive solar costs. The bank will not be of much use if there are no passive solar homes being built. It will take a long time for consumer demand, only utilizing the bank, to increase the number of builders building passive solar houses. We feel that the direct credit, which can be no more than $2,000, will be a quicker method of getting more passive solar houses built. We also think that even though the tax credit will not be a major drain on the tax revenues, it should continue only until it stimulates the growth of widescale passive solar construction. Once builders begin to construct passive solar homes and homeowners realize their tremendous energy saving potential, passive construction will become standard in areas where it is beneficial, thereby eliminating the continued need for a tax credit.

In summary, we feel that the passive solar tax credit for builders is the most cost effective and efficient way to insure the construction of energy-efficient homes because:

It would expedite passive solar construction;

The performance method is workable and understandable for all builders;

The performance based credit encourages construction of well insulated homes;

It is the method builders prefer by over a 2 to 1 ratio and, therefore, would encourage increased passive solar construction; and

It is a more cost-effective use of federal funds than the solar bank.

Thank you for giving me the opportunity to present our views for you today. Mr. Chairman, I will be pleased to answer any questions which you or your distinguished Committee may have.

The CHAIRMAN. Thank you very much, Mr. Peterson.

Mr. Winter, welcome to the committee, sir.

STATEMENT OF STEVEN WINTER, ON BEHALF OF STEVEN WINTER ASSOCIATES, INC., NEW YORK, N.Y.

Mr. WINTER. Thank you.

Mr. Chairman, members of the committee, attendees at this hearing, I am Steven Winter, president of Steven Winter Associates, architects-engineers in New York City.

By way of background, I have degrees in architecture and architectural technology and am licensed to practice architecture in 34 States. I am an adjunct professor of architecture at the Pratt Institute and have been a visiting professor at Harvard, MIT, Columbia, and Carnegie-Mellon.

My firm specializes in providing design, engineering and other technical services, including passive solar design and analysis to homebuilders throughout the United States. These homebuilder clients include large and small companies, builders using various technologies such as wood, block, brick, and steel, and producers of different housing types, such as single family, attached, townhouse, et cetera.

We have undertaken professional assignments for more than 200 builders in the last 8 years, and in the past 12 months alone, our clients produced over 120,000 housing units, about 7 percent of the housing in the United States.

We are also actively involved in adjunct areas of the housing industry. We are members of more than 20 industry associations and serve on 17 technical committees related to housing. We have undertaken dozens of housing-related research projects for Govern-

ment agencies. We have conducted or made presentations at scores of seminars, conferences, and workshops on passive solar design in housing.

Our close contact with the homebuilding industry affords us a particularly extensive insight into its trends, the attitudes of its participants, and the types of forces that motivate change within it, specifically in the area of passive solar design.

In the real world of housing, a builder will incorporate passive solar systems into his homes within one of three basic motivational situations.

In the first, he can operate without any special subsidies or programs and can seek to design, build, and sell passive solar homes in the free marketplace competing against conventional homes. He must take the risks of including additional first costs to the home and of incorporating in his eyes unproven techniques.

Builders are reluctant to be pioneers. Homebuyers have balked at paying additional costs despite the subsequent reductions in fuel bills. Therefore, we believe the situation is not conducive to the advancement of passive solar techniques.

In the second situation, the builder can participate in programs which provide incentives by subsidizing design costs. These can be high for passive solar homes, between $2,000 and $20,000 per home, but are usually first time costs only.

Many of the Department of Energy's programs have been conducted in this area. Our firm has been the fortunate recipient of many such assignments. However, the subsidies result in very little, if any, financial incentive to the builder, even though they do identify his incremental construction costs and the home's potential energy savings.

These progams have been quite successful and have resulted in innovative, attractive, and energy efficient house designs, but they have resulted in, I understand, relatively modest growth in the number of passive solar homes actually built.

In the third scenario, the builder can participate in a program where the Government provides direct incentives by subsidizing construction costs. No such program currently exists, and I see the proposed passive solar tax credit bill as a viable means to encourage widespread use of passive solar techniques by homebuilders.

When the incentive to build is there, the builder will procure the necessary design services and will undertake the marketing effort necessary to convince home buyers of the benefits of passive solar homes.

Let me cite a specific example. One of our builder clients is Ryland Homes, located quite close to here in Columbia, Md. In 1979, the company built 3,819 homes for $246 million in sales. It was ranked 10th in dollar volume amongst the Nation's homebuilders.

The company is sophisticated, aggressive and innovative. It conducts extensive design and research programs to improve productivity, to reduce construction costs, and to gain consumer appeal.

They have built one passive solar home, and that was as part of a competition. Why only one? No incentive, that's why.

As a result, each of the 3,819 homes will use about 7 Btu's per square foot per degree day per year of energy versus about 3 for a

passive solar home. Seven versus three. This represents a difference of about $1.25 million in fuel consumption per year for the homes Ryland Homes built in 1979 alone.

Gentlemen, you have a unique opportunity to enact legislation whereby virtually nobody loses. Passive solar construction is cost effective, buildable, saleable, and attractive. It needs a good kick in the foundation to get it going.

The proposed passive solar tax credit bill includes the appropriate ways and means for getting the job done.

Thank you.

The CHAIRMAN. Thank you very much, Mr. Winter.

Mr. Kennedy, we would be pleased to hear you.

STATEMENT OF D. SCOTT KENNEDY, ON BEHALF OF THE DUCKER RESEARCH CO., INC.

Mr. KENNEDY. Thank you very much, Mr. Chairman.

Members of the committee, I want to thank you for the opportunity to appear before you this morning. As a little background, Ducker Research Co. is a specialist in marketing research for residential and nonresidential construction products.

Over the past 20 years we have been involved in the sales and marketing of virtually all major materials and products used in both residential and nonresidential construction, both new construction and retrofit.

We are generally recognized as one of the leading experts in the marketing of new and existing materials and products to the construction industry.

In 1979, our firm was commissioned by the Solar Energy Research Institute to study passive solar concepts among residential builders and designers. The study was based upon in-depth, personal interviews in 13 metropolitan areas across the United States, and, of course, drew on our substantial background in the construction industry.

The study developed a number of conclusions that I believe have a direct bearing on today's discussion.

First, the homebuilder is the key to the passive solar design decision. Architects are important influences. However, if passive solar concepts are to obtain widespread acceptance, builders must regularly use passive solar concepts in designing their homes.

Second, because most home buyers are restricted to the home designs offered to them by the builder, homeowners will not be in a position—to use a marketing term—to pull the passive solar design concept through the homebuilders.

Homeowners have to be aware of the concept, but it is the homebuilder who will make the decision.

Third, it has been our experience that acceptance of a new product or new concept in the construction industry normally requires a minimum of 10 years. I have cited two examples in my written statement. I can cite more.

Fourth, obtaining acceptance of passive solar concepts—which is really no different than any other product being offered to the construction industry—within 10 years will require a comprehensive promotional effort involving private industry, the U.S. Department of Energy, and other interested groups.

The promotional effort is already underway. It will help improve builder and homeowner awareness of the passive solar concept, but it will not do the whole job.

The best method, in our opinion, of encouraging homebuilders to use passive solar concepts is to offer a performance base energy tax credit directly to the builder.

A tax credit to home buyers would only have an influence on the small percentage of homes which are custom built and which generally account for less than 10 percent of total residential construction.

The fifth point I would like to make is that a tax credit to the homebuilder should not imply that home buyers will not receive any benefits. Owners will be able to purchase passive solar homes without paying a price premium compared to conventional designs.

Most builders will, either directly or indirectly, pass the credit along to the home buyer by offering homes with superior energy performance at little or no increase in selling price.

In conclusion, without a builder tax credit, general industry acceptance of passive solar design techniques will require at least 10 years. The builder tax credit currently before this committee should cut that acceptance period in half, to approximately 5 years.

I thank you for your attention. I welcome your questions.

[The prepared statement follows:]

STATEMENT OF D. SCOTT KENNEDY, DUCKER RESEARCH CO., INC.

Ducker Research Company, Inc. is a specialist in marketing research for residential and nonresidential construction products. Over the past twenty years, the Company has been involved in the sales and marketing of all major materials and products used in residential and nonresidential construction. Our client list includes many of the major suppliers of building materials across the United States. We are generally recognized as one of the leading experts in the marketing of new and existing materials and products to the construction industry.

In the fourth quarter of 1979 our firm was commissioned by the Solar Energy Research Institute (SERI) to study the awareness of and reactions to passive solar concepts among residential builders and designers. The study was based upon in-depth, personal interviews in thirteen metropolitan areas across the United States, as well as our substantial background in the construction industry. The following summarizes the results of this study.

First. There are approximately 50,000 companies involved in building new residential structures in the United States. Approximately 48,000 are small firms starting under 100 homes per year, with an average annual production of 23 home per company. These 48,000 small builders account for almost two-thirds of all residential construction.

Second. Although there are exceptions, most builders work with five to six basic home designs, plus a few variations upon these basic designs. Because of the additional cost involved, home builders rarely change their designs. Design changes have become even less frequent over the past five years, as builder profit margins on new homes have fallen below five percent, before taxes.

The primary concern of any residential builder in choosing a design is the salability of the home. If builders have any thoughts that a new design will be difficult to sell, they will not use the new design. Most will be unwilling to try a new design, or a new product, until they have seen it successfully used in other homes within their trading area.

Third. Overall, passive solar design concepts were very well received by residential builders and designers across the United States. However, the majority were reluctant to use these concepts in their own home designs because of fears that the additional cost required could not be recovered through higher selling prices to the home buyer.

In many cases, the additional cost of adding passive solar features could severely limit the builder's already small profits. Unless builders receive an additional incentive, they will be reluctant to use passive solar design concepts until they are convinced of passive solar's marketability. This builder reluctance could delay gen-

eral acceptance of passive solar concepts for at least ten years and, perhaps, as long as twenty years.

Fourth. Based upon levels of interest demonstrated in interviews conducted for the SERI study, the long-term potential for passive solar designs is excellent. At an average annual construction of 1.2 million single-family homes, about two-thirds of this total, or 800,000 units, could incorporate some element of passive solar design.

The home builder is the key to the passive solar design decision. Architects are important influences; particularly in today's market, where most passive solar installations are in custom homes. However, architects are involved in less than ten percent of total residential construction. If passive solar concepts are to obtain widespread acceptance, builders must regularly use passive solar concepts in designing their new homes.

Homebuyers will make their purchase decisions on the full value of the home, including location, aesthetics, expected fuel cost and price. However, the homebuyer rarely will seek out a passive solar home. Because most homebuyers are restricted to the five or six basic home designs offered by a builder, homeowners will not be in position to pull the passive solar design concept through homebuilders. The homeowners should be familiar with the concept, but it is the homebuilder who will determine if passive solar designs are to be incorporated into new construction.

It has been our experience that acceptance of a new product or concept in the construction industry requires a minimum of ten years. For example:

Steel entrance doors required ten years to achieve a 50 percent penetration. Steel doors were first promoted to the homebuilder as a cost saving option to wood doors. As penetration slowly increased, homebuyers became aware of metal doors and their superior thermal properties when compared to wood. Now steel doors are being promoted by the builder to the homeowner as a superior product.

Prefabricated fireplaces achieved a 40 percent penetration in 1977, after ten years of extensive promotion by manufacturers. They have been sold to the homebuilder as a lower cost fireplace compared to conventional brick construction. Builders generally have accepted the concept, but still have not emphasized the prefabricated nature of the fireplace to homebuyers.

Obtaining acceptance of passive solar concepts within ten years will require a comprehensive promotional effort involving private industry, the United States Department of Energy, and other interested groups. This promotional effort, which is already under way, will improve builder and homeowner awareness of passive solar concepts and should help to convince the builder that passive solar designs present additional selling features that can be offered to homebuyers.

Although this promotional effort is important, the best method of encouraging homebuilders to use passive design concepts is to offer a performance-based energy tax credit to the builder. This credit must be offered to builders, for two reasons. The homebuilder is the key decision maker who will determine the acceptance of passive solar design concepts.

Because of small profit margins, builders will not be willing to risk the additional cost of passive solar designs without a guarantee that at least part of these incremental costs will be returned to the builder.

A tax credit to homebuyers would only have an influence on the small percentage of homes which are custombuilt (under 10 percent of total residential construction). Builders will be unwilling to offer higher cost passive solar designs, even if buyers qualify for a tax credit, because of fears that buyers will have no interest in purchasing higher priced homes and applying for offsetting tax credits.

This is not to imply that homebuyers will not receive any benefits from the builder tax credit. In fact, owners will be able to purchase passive solar homes without paying a price premium compared to conventional designs. Most builders will, directly or indirectly, pass the tax credits along to homebuyers by offering homes with superior energy performance at little or no increase in selling price.

Without a builder tax credit, general industry acceptance of passive solar design techniques will require at least ten years. The builder tax credit currently being considered by this committee should cut the acceptance period in half, to approximately five years, resulting in a substantial energy savings to the United States.

Thank you for your attention.

The CHAIRMAN. Thank you very much, Mr. Kennedy. Are there questions?

You have been very helpful. We appreciate your coming before the committee. Thank you.

Mr. FOWLER. Mr. Chairman.

The CHAIRMAN. Mr. Fowler.

Mr. FOWLER. I would be interested, Mr. Peterson, in your statement you said that the method contained in H.R. 7688 for promoting passive solar is preferred by builders by over a 2 to 1 ratio. What does the one say? What method do they prefer?

Mr. PETERSON. The information presented there was the result of a survey, and Mr. Bell could respond to that.

Mr. FOWLER. In other words, we are looking for the best way to do it. I am pleased with a unanimous endorsement, but when everybody is thinking alike, nobody is thinking much.

Mr. BELL. We had the NAHB Research Foundation do a postcard survey of builders who had responded to their annual survey about having a knowledge of passive solar. Two questions were on the survey.

Question 1 was, "Would such a tax credit encourage you to use more passive solar techniques in your home?"

The respondents answered 456 yes they would and 110 said no. One person left it blank.

Question 2 was, "Do you think the tax credit would be a sufficient incentive to increase the number of home starts?" Out of the 548 that answered, 189 thought yes it would be, and 364 felt no, it would not be a sufficient incentive to increase the starts. Six left it blank.

Mr. FOWLER. Gentlemen, the provisions for these incentives for passive solar heating systems in new residences, those of us who are the initiators of this legislation believe it is, as you know, an important first step. But I am particularly interested in going beyond this to assist both in retrofits of existing residences and in passive cooling systems.

It seems to me that these applications are especially important for lower- and middle-income people and for the elderly in our country who live in so much of the existing housing stock.

I would be very interested in your comments either now or later in writing about possible methods for achieving these objectives.

Mr. PETERSON. If I could respond in this manner? I think many new products and techniques that show up in remodeling work are spotted by a homeowner traveling through model homes of builders. You don't see builders putting in certain types of new appliances because he saw them in a remodeling job. You see the opposite occur, so I think the inclusion of passive solar features in model—builders' model homes would stimulate activity in the retrofit remodeling side.

Mr. KENNEDY. If I could add a point to that.

Mr. FOWLER. Yes, sir.

Mr. KENNEDY. We have done a fair bit of work in dealing with homeowners and what they will or will not consider for retrofit applications.

Generally homeowners become very reluctant to consider a technology or any kind of an energy improvement that will run—that will cost them more than $1,000 to $2,000 in out-of-pocket expenses.

I would suggest again, to reinforce this statement, that if a homeowner sees it, sees a passive solar design and sees that it works in new construction, he will be much more willing to consider the concept.

I certainly agree that the 75 million residences out there are very attractive candidates for remodeling, but I would suggest that a credit to the homebuilders is a good first step. I would certainly encourage additional work beyond that point, and I certainly would encourage that you take that first step.

Mr. FOWLER. In your testimony you state that architects are involved in less than 10 percent of total residential construction. They all use only five or six designs. Can't you architects do something about that, Mr. Winter?

Mr. WINTER. I would love to do something about that, Mr. Fowler. Actually I believe the figures would be significantly less than 10 percent, perhaps as low as 2 percent, in that most single family residences are not custom designed. They are derived from plan books or generated from people who are not licensed to practice architecture. Basically there are relatively few practicing architects in the field of single family home design.

I would like to address the question you asked for a second. That is, how else can we provide incentives for the adoption of passive solar? I do agree that new construction is a very important first step in that new construction, particularly single-family, is the most visible. It gets the most marketing, the most press, and the most push from major homebuilding companies.

One area you may consider is that of multifamily construction.

As I understand this bill applies only to those construction projects of fewer than five units. So the multifamily might be another area you would consider addressing.

Again, the multifamily new construction, I believe, would have a wider ripple effect than retrofit multifamily construction.

Again, you know, why do architects not design passive solar homes? We are fortunately or unfortunately very much at the mercy of the builders. The prime motivation comes from the builders.

If the builder decides to hire an architect, it is wonderful for us architects. The incentive has to be there for him to want to build passive solar in order to acquire the design services to produce those designs.

Mr. FOWLER. Maybe you just ought to steal some of the copy books and stick in an extra page.

Mr. WINTER. Unfortunately, someone would steal a copy book for Hawaiian design and build it in Maine. Not much energy would be saved.

Mr. FOWLER. We could get Mr. Frenzel on board here if we could just get some sunshine in Minnesota. It does work both ways.

Thank you, Mr. Chairman.

The CHAIRMAN. If there are no further questions, thank you very much. I appreciate your appearance.

Our next panel: Representing the International Union of Bricklayers and Allied Craftsmen, Gerald Carlisle, treasurer; representing the Brick Institute of America, John P. Gleason; representing Mason Contractors Association of America, George Miller; and representing the National Concrete Masonry Association, Donald C. Sheffield.

Without objection, each of your statements will appear in the record in full, including supplemental materials.

We welcome all of you to the committee.

STATEMENT OF JOHN T. JOYCE, ON BEHALF OF THE INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTSMEN, PRESENTED BY GERALD CARLISLE, ACCOMPANIED BY JOHN P. GLEASON, JR., BRICK INSTITUTE OF AMERICA; GEORGE A. MILLER, MASON CONTRACTORS ASSOCIATION OF AMERICA; AND DONALD C. SHEFFIELD, NATIONAL CONCRETE MASONRY ASSOCIATION (MATHIS-AKINS CONCRETE BLOCK CO., MACON, GA.)

Mr. CARLISLE. I am Gerald Carlisle, treasurer of the Bricklayers International Union. Mr. Joyce was not able to be here this morning.

The masonry industry is gratified to have this opportunity to testify in support of passive solar energy tax credits as embodied in H.R. 8019 and S. 2794. In addition to the brief statement I will make on behalf of this panel, the other panelists will file written statements of their own.

They are: John P. Gleason, president, Brick Institute of America; George A. Miller, executive vice president, Mason Contractors Association of America, and Don Sheffield, chairman of the board, National Concrete Masonry Association.

This is a panel composed of organizations representing labor, contractors and product producers. As such, we believe it is fairly representative of the entire multi-billion dollar masonry industry, an industry which provides direct employment for about half a million people.

The masonry industry has for almost 7 years been deeply involved in questions of energy conservation and efficiency in buildings. We have made deep commitments of money and time to research pilot projects and other endeavors aimed at studying the energy performance of buildings and building components, and at discovering better ways to design and build structures so that they will be more energy efficient.

I wish to be brief and direct about what we have found out. There is still a great deal that is unknown about the thermal performance of buildings, but there is no doubt that the best, most practical and most cost effective way to make buildings more thermally efficient, thereby reducing the amount of fossil fuel derived energy needed to heat and cool them and saving consumers and our Nation enormous amounts of money is through passive solar design.

We say that passive solar design is the best way because it is a natural, nonpolluting, nondepleting approach to the energy problem.

We say that it is the most practical way because the design and application technology of passive solar is well known. The products already exist. Designers understand how to make it work. Contractors are ready to bid the jobs. And craftsmen are available and prepared to do the work. For the fact of the matter is that passive solar requires nothing new. Throughout history people have understood and used passive solar design. All we need to do is relearn an approach to building design that was commonplace until this century and the era of deceptively abundant and cheap energy.

We say that passive solar is the most cost-effective means of energy conservation and efficiency because it can mean a savings of up to 80 percent in the cost of heating a home, and the elements of a passive solar energy heating system—walls, floors, fireplaces, windows and so forth, all serve multiple purposes.

Now, if passive solar is everything we have said it is, then why, you may ask, are we here today pleading for financial incentives to give it a boost? Will passive solar not succeed on its own?

The answer is that it probably will, but the economics of the housing industry are such that without financial incentives to homebuilders, passive solar will take a long time to fulfill its potential.

Homebuilder representatives will tell you that most of the people and firms who build and sell homes are small businessmen who cannot afford to invest in passive solar design until it is proven that home buyers demand it and will pay for it, or unless there is some other financial incentive.

And so we are convinced that the kind of financial incentive envisioned in the legislation now before this committee is an absolute necessity if our Nation and our society and our people are to enjoy fully the fruits of passive solar within the next half century.

Most of our present housing inventory was produced during the era when energy seemed abundant and cheap. It is estimated that in the next 50 years our Nation will replace its existing housing inventory with new housing. We now know that our new housing must be energy-efficient housing, which is to say that it must be passive solar housing.

In the legislation before you, the Congress has the best available tool with which to insure that henceforth houses we produce will be energy-efficient.

The masonry industry has a major role to play in the passive solar field, and we are prepared to respond. We are developing passive solar designs and application guildelines. We will be educating our own industry about the use of those materials. We will be developing materials that will assist homebuilders in building and selling passive solar homes.

But what we can do and will do will be fruitful only if there is a practical incentive for homebuilders to become involved with passive solar.

The practical effects of the legislation before you will be enormous. Passive solar can make a major contribution toward solving our energy problems; it can ease the economic pressures of escalating energy costs on homeowners; and it can help us improve the quality of our houses. It can be as significant in its own way as the advent of central heating and air-conditioning.

For all these reasons, we ask the Congress to pass this legislation, and to do so expeditiously.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Mr. Carlisle.

Would any other panelist wish to present oral testimony?

Mr. CARLISLE. The other representatives here have submitted a written statement to you. They are available for any questions you might have, Mr. Chairman.

The CHAIRMAN. Thank you. All of your statements then will appear in the record.

[The prepared statements follow:]

STATEMENT OF JOHN P. GLEASON, JR., ON BEHALF OF THE BRICK INSTITUTE OF AMERICA

My name is John P. Gleason, Jr., and I am President of the Brick Institute of America (BIA), the national trade association for the manufacturers of brick and other structural clay products. Our member manufacturers represent 83 percent of the annual production of brick in this country; in an average year that would constitute 9 billion bricks worth nearly a billion dollars.

We are grateful for the opportunity to present comments in support of the passive solar tax credit bills being reviewed today and commend the Chairman for his foresight and recognition that promotion of this building concept will reap great returns in future energy conservation and environmental quality.

I will touch only briefly on the specifics of the three bills, as considerable comment has already been heard on their structure and the means for implementation of the tax credit. BIA believes the concept of start-up incentives to encourage builders to get this technology into the marketplace is good and proper given the future projected benefits. A program expiration date, anti-double-dipping provisions, and performance criteria to determine actual energy savings, and the amount of the tax credit, are all important provisions in the proposed legislation. These provisions demonstrate the extent to which this legislation has been well thought out and thoroughly refined.

Of further note, of the five elements needed to qualify as a passive solar system, the three most critical, heat absorbtion, heat storage in a mass material and reradiation, are performed superbly by brick masonry. This explains my presence here today, and it also explains why BIA has been the leader of the building materials industry in the development, promotion and commercialization of passive solar design technology.

Seven hundred years ago American Indians in the Southwest discovered the energy efficiency of massive materials in homes built of adobe brick. The heat absorbtion and storage capacity of the brick walls tempered the heat of the day. At night, the adobe brick would reradiate the heat absorbed during daylight hours, and provide warmth during the cool of the evening. These same principles are the fundamental properties of good passive solar design.

In the early seventies, before the term "passive solar" came into use, BIA was pursuing energy efficent buildings, that incorporated the natural environment. in a BIA research publication printed in 1974, reference is made to building orientation, shape, penetration, heat gain, heat storage capacity, reradiation, and use of earth berms and natural ventilation. These fundamental factors of passive solar design and construction were first identified and quantified byt BIA researchers, and today are part of the standard passive solar vocabulary.

In more recent years, rising energy costs coupled with a growing disenchantment with active solar systems, the public has begun to rediscover the simple principles of energy efficient design and the use of materials that will work with the environment instead of against it.

Today, BIA presents itself as a leading expert in the field of passive solar design and construction techniques. Our division of engineering and research has sponsored workshops for builders and architects in various regions of the country. These seminars highlight the technical refinements necessary for constructing climate-specific, and functional passive solar structures. Further, our engineers have produced and will soon release the second edition of a three volume set of guidelines for builders and designers to achieve the best possible solar yield for a particular area.

Beyond technical development, BIA has worked closely with the Department of Energy (DOE) in the commercialization and promotion of passive solar products and design techniques. BIA was a charter member of the then informal Passive Solar Industries Council. Together with DOE and the Associated Collegiate Schools of Architecture, we co-sponsored a successful national design competition. Over 2,200 upper level architectural students submitted designs that incorporated the application of passive solar technology in commerical buildings. The winning designs from this competition have been displayed in numerous public arenas and are now being prepared for publication.

In addition, BIA, its affiliated regions and member manufacturers have produced numerous promotional and technical materials aimed at builders, architects and to the general public. Further, many BIA member manufacturers have constructed

passive solar homes for display, and testing, while being used as residences. Their experience demonstrates two important facts; that energy saving solar homes need not look like "space houses" and are able to fit neatly into traditional neighborhoods. And secondly, passive solar houses do indeed perform according to design and fossil fuel heating needs significantly reduced in every day use.

To conclude, BIA is thoroughly convinced that passive solar design and construction is a major avenue toward future energy savings in our nation's homes and commercial buildings. However, two significant circumstances come to mind that would impede its broad scale use and acceptance by the general public.

There are certain up-front costs (as detailed in earlier testimony by the National Association of Home Builders) that would increase the intial cost of new homes. In today's housing market, builders can ill afford such additional risks, even though the longer term benefits are great. A tax credit to builders would go a long way toward lessening their risks, and help get passive solar homes into the marketplace and before the general public.

A second major impediment that might be of potentially greater significance to public acceptance would also be addressed by a passive solar tax credit.

When active solar systems were introduced in the early 1970's the market was flooded with ill conceived and untested systems that were poorly designed and used second rate materials. The results were predictable. Unfulfilled claims of energy savings, frequent failures, and constant maintenance gave active solar heating systems a bad name. Unfortunately, much of this reputation has been transferred to the concept of passive solar systems.

A tax credit will enable builders to consult with the appropriate design experts and use quality materials. In short, the credit will assist builders to construct passive solar systems that will be attractive and functional. If these two simple criteria are met in early demonstrations, the passive solar concept will become accepted, and benefit both the consumer and the nation.

I thank the committee for its time.

Statement of George A. Miller, on Behalf of the Mason Contractors Association of America

The Mason Contractors Association of America, representing some 1,500 contractors in the United States and Canada, strongly support legislation to grant tax credits to builders who employ passive solar energy designs in their homes.

We are convinced that tax credits are the best and quickest way to create a passive solar energy market in the home building industry, and our national interest in energy conservation, and the interest of consumers in reducing energy costs, demand that such a market be brought into existence as soon as possible.

On behalf of the members of our organization, I assure the Committee that mason contractors stand ready to do their part to make "passive solar" a reality. We are participating in masonry industry projects designed to create a body of design and application information on "passive solar" that can be used by home builders. And we are preparing to take part in broad efforts to teach the design and application principles of "passive solar" to contractors, craftsmen, and home builders.

In short, the masonry industry is moving ahead on "passive solar"—but we are doing so on the assumption that there will be a market for it. This is the biggest question about "passive solar", and it is a question the Congress can answer in the affirmative by approving legislation to grant tax credits to builders who employ passive solar design and application.

We hope this committee will approve such legislation, and that your action will be followed quickly by approval from the entire Congress and the White House.

Statement of Donald C. Sheffield, on Behalf of the National Concrete Masonry Association

My name is Don Sheffield and I am Chairman of the Board of the National Concrete Masonry Association. I am also President of Mathis-Akins Concrete Block Co., of Macon, Georgia; as such, I speak as a small businessman who also represents a trade association made up of small businesses. The concrete masonry manufacturing industry is made up of approximately 1,300 plants which produce masonry construction products for use in all communities in the United States.

Our industry is particularly enthusiastic about passive solar design because the standard, everyday products we manufacture inherently possess the properties needed of reflective passive solar collection and storage. The property of "thermal

mass" is crucial to the performance of passive solar buildings and concrete masonry has this property.

We are also enthusiastic about passive solar energy because we know that it will be a significant contribution towards solution of the energy shortage. Several years ago it was predicted that solar energy would provide about two percent of our needs by 1985 if we had major federal action to accelerate its commercialization. But this prediction did not take into account the enthusiastic response solar energy would receive from architects, engineers, builders, and home owners, who look upon it as a challenge and an opportunity to innovate.

Initial emphasis in solar energy was given only to active solar systems, which consist of solar collectors, heat exchangers, thermal storage elements, pumps, extensive plumbing, air blowers, valves, and other control devices in various arrangements. Little attention was given to passive systems which do not require all of the fancy hardware used for active systems. But it is the passive systems which may well generate a greater-than-anticipated contribution to the total energy problem. Passive solar systems have certain advantages over the more common active solar, and conventional space conditioning systems:

(1) Thermal storage masonry walls for instance, can be designed to perform the dual function of building structure and thermal mass, resulting in lower additional costs.

(2) Properly designed passive heating systems are as efficient as active systems that use flat-plate collectors.

(3) Passive systems are less expensive to operate and maintain than active solar systems, since they have no moving parts that use energy and can break down.

(4) Passive systems do not need to be elaborate and complicated. They can be applied in small increments, thus permitting one to gain experience without making a large commitment.

(5) Passive solar systems are cost effective. People who have been working with, and researching passive solar systems advocate that passive solar systems are more cost effective than buildings with active solar systems. Construction, operation and maintenance costs of completed, inhabitated passive solar buildings seem to support their assertions. The long life of passive systems contributes to its cost-effectiveness. Once installed, passive components perform their function for the life of a building and may actually increase in value in proportion to the value of the building.

In summary, I would like to quote from J. D. Balcomb, an authority on the subject of passive solar: "The intriguing thing about these (passive) approaches is not only that they are architecturally more compatible with normal building practices and aesthetically more pleasing, or that they should be lower in cost than active systems, but that they apparently work so well. Not only do they work well, but they appear to work relatively well in crummy climates with a great amount of diffused solar energy where active systems can hardly perform effectively. This is because a passive system is always working when any sum is shining. It collects every bit of energy, direct or diffuse that comes through the glazing. An active system has a threshold and does not begin to work until a certian temperture is achieved. This largely compensates for the fact that the energy losses in the passive system are undoubtedly greater than they are in an active system. I also feel that passive solar heating can be made even more comfortable for the occupants of the building than conventional fossil or active solar systems."

Passive solar energy design can make a significant contribution towards our nation's overall energy conservation goals and we support the passive solar tax credit because the credit goes where it will do the most good, to the builder. The credit will aid in removing the element of risk from the builder's decision to incorporate passive solar features. The fact that the amount of the credit is determined by the effectiveness of the systsm and not by the cost, encourages the use of efficient, cost effective passive solar designs and does not discriminate against larger builders whose installed costs may be less because of volume discounts. It also avoids the pitfalls of trying to determine the incremental cost of the passive solar components against the building materials it may have replaced.

The CHAIRMAN. You represent the Bricklayers and Craftsmen, the Institute, the Laborers International Union as well as the Contractors and the Masonry Association.

What role does your masonry industry play in solar? What is your particular interest?

Mr. CARLISLE. All of us in each of the organizations represented here have had a role in one way or another in encouraging the building of passive solar homes.

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Each of us is also involved in an organization called the Masonry Industry Committee, where we have worked collectively on design guides, plans, and so on, which we will be working more with in the future.

In addition, we are working with our own members in each of the organizations to make them better able to meet the needs for passive solar housing in the future.

Maybe Mr. Gleason would like to comment.

Mr. GLEASON. To answer your question even more specifically, of the five elements that have been discussed here and presented to you as the elements needed to qualify as a passive solar system heat absorption, mass material, radiation, three of the five elements are performed by brick masonry in total, and that really explains why we are so interested in passive solar legislation.

The CHAIRMAN. Trombe walls are a very important part of passive solar, and that is primarily masonry with an airspace and then glass; is that right?

Mr. GLEASON. That is correct; and there are five types of systems. Direct gain, we have heard comments like the greenhouse method where you use glass, the floors and the walls will absorb the heat as it enters through that glass; and in the evening it will reradiate that heat back into the room.

There are different types of techniques. There are several systems, and if you would like a more technical explanation I would be glad to make a report and submit it to you formally on different types of systems.

The CHAIRMAN. We appreciate very much your interest in passive solar. It is an exciting concept and one that is going to need not only active support but the innovative support from industries like yours.

Are there any questions?

If not, thank you very much for appearing.

Mr. GLEASON. Thank you, Mr. Chairman.

The CHAIRMAN. The committee will ask the remaining two panels to be available here at 2 o'clock, so the committee stands adjourned until 2 o'clock.

[Whereupon, at 12:05 p.m., the committee recessed, to reconvene at 2 p.m.]

AFTERNOON SESSION

The CHAIRMAN. The committee will be in order, please.

Our next panel is made up of representatives from the Solar Lobby, Bruce Anderson, chairman; Solar Energy Industries Association, Allan T. Howe, our ex-colleague; and Total Environmental Action, Inc., Paul Sullivan, president.

I ask you to come to the witness table and, without objection, each of your statements will be included in the record in full with supplemental materials.

Mr. Anderson, you may proceed.

Mr. ANDERSON. We have discussed this as a group and Allan Howe will be going first.

The CHAIRMAN. It is a real pleasure to welcome back our ex-colleague, and we are happy to see you here engaged in a very worthwhile endeavor to save energy and get our own house in

order so that we can utilize the energy that is freest of all, and that is solar.

Welcome to the committee.

STATEMENT OF ALLAN T. HOWE, ON BEHALF OF THE SOLAR ENERGY INDUSTRIES ASSOCIATION

Mr. HOWE. Thank you very much, Chairman Ullman and members of the committee.

I am delighted to be here as the representative of the Solar Energy Industries Association, SEIA, which is the major trade association for the solar industries in the United States.

I won't spend a long time in the background of the association's work except to say that there are many different solar technologies represented in the trade association, one of which is the Passive Solar Products Division, which includes companies that are into the manufacturing and marketing of some of these products.

Of course, many of those things are not yet in great demand, because we need incentives in the type of thing that we are talking about in these bills today.

The association strongly supports, Mr. Chairman, members of the committee, the provisions of these bills on which these hearings were held, H.R. 8019, 7688, 7690, and we certainly commend you, Mr. Chairman and other members of this committee who have so vigorously supported these bills and are vigorously working to see that they are enacted into law.

We have had a very active record in supporting tax credits for builders for passive solar in the past. We supported this effort in the Energy Tax Act in 1978 when it was before this committee and before the Congress in general for adoption and, of course, the amendments to that act in the Windfall Profit Tax Act this year.

We supported Senator Hart's effort over on the Senate side to amend the Senate bill on the floor successfully, and we tried to help that effort along.

We were hopeful that this provision would stay in the conference report, but I think now we have an opportunity to correct what I think was an oversight of cutting short this very essential incentive in providing tax credits for builders for passive solar.

I would say that there are many reasons why this should be done. I think that other witnesses today have hit on those quite well. I won't take a long time to reiterate those points, except to say that it has not happened.

Congressman Heftel made that point very well, and it is timely that we do get it done. The fact is it does cost money for a builder to make the design, to include those types of design features in homes. There should be some incentive for him to do that, because in this type of a depressed market at the present time anything that adds additional cost would certainly not be attractive, given the present state of the housing market, so I think that it is essential that the incentives be provided.

We are going to gain many benefits if we do so, one of which, as you heard the Department of Energy and the Treasury Department people explain, is energy savings.

We feel strongly about that and we believe it would be a stimulus for other products in the homebuilding markets, such as insula-

tion products, active solar products that might work with the passive systems in certain structures in a hybrid passive solar design, so there are some wonderful linkages between different things that can be done between the incentives that would be provided by the legislation here.

I won't take too much more time to go through other points in my statement.

I will say that I certainly believe, Mr. Chairman, that the opponents who have at times said that we should not really give incentives for things that people are going to do, and this is one that they might do anyway, I really don't think that fits here because the fact is that it is really not being done.

The whole use of passive solar in conservation in building structures for residences is something whose time has come and it is the fact that it has not been done indicates that we need to have some incentive to make that move.

The fact is that many people will continue, I am sure, to put off the time when they would make a conversion to renewable energy sources, but if we respond by some type of incentive it will move that timetable forward, and I think it will move it many years ahead of what we would ordinarily find.

I did have one other suggestion, Mr. Chairman, and it goes to some of the questions that came up this morning, if I could take a minute longer to go into that.

The suggestion was made that we ought to have some recognition in this bill for handling retrofit and individuals' qualifications. It seems to me that maybe there ought to be a review by the committee of the present status of those tax credits that are in place.

As the committee well knows, as to the tax credit, the Treasury people this morning indicated the credits are applicable for passive solar. The regulations written by the Internal Revenue Service say that if it is part of the structure, part of the structural component, then it cannot qualify.

It seems to me the committee might consider some type of a clarification in this legislation that would say clearly that it is their intent that those credits be applicable for passive, and if they want to incorporate the recognition points that you have in this bill, then that might clarify the point for definitional purposes, and it is those tax credits that ought to be applicable for individuals, it seems to me, and this of course would be coming from the other side where the builders would take the initiative to employ passive.

I could go into that further if we have time, Mr. Chairman.

We do have some other suggestions to make to you along that line.

Thank you.

[The prepared statement follows:]

STATEMENT OF THE SOLAR ENERGY INDUSTRIES ASSOCIATION

I am pleased to appear today before you as the representative of the Solar Energy Industries Association (SEIA), the major trade association of solar industries in the United States. I am the Director of Government Relations for SEIA, and as such am the coordinator of government programs with our member companies. SEIA has a membership of over 800 at present, most of which are companies involved in some phase of solar energy. Some of these member companies are manufacturers and sales representatives of various passive solar products, and have had some first-hand experience with the challenge of marketing those products. SEIA's organiza-

ional structure allows its members to be grouped in various divisions which repre-
ent different solar technologies. The Passive Division of SEIA is the membership
rm for companies with an interest in passive solar products and is chaired by a
epresentative of the member companies. This person also sits as a member of the
oard of Directors of the Association. I mention this to give you some background
n the place which passive solar has in relation to the other solar technologies in
he trade association.

The Solar Energy Industries Association strongly supports the provisions of H.R.
019, H.R. 7688, and H.R. 7690, and commends the sponsors of these bills. Especial-
y, Mr. Chairman, we commend you as the Chairman of this important committee,
or taking the initiative to sponsor H.R. 8019 and to promptly sponsor this hearing
n the bill.

SEIA has advocated a passive solar tax credit for homebuilders for several years,
nd actively supported the idea in the discussion of the solar tax credits in 1978 and
he succeeding amendments finally passed in 1980. We supported the passive solar
ax credit sponsored by Senator Gary Hart of Colorado, which was successfully
arried as an amendment to the package of tax credits in the Windfall Profits Act
ill. We regret that this feature of that bill was not included in the final conference
eport. Now we have an opportunity to correct that error.

While the companies which are manufacturing and marketing passive solar prod-
cts are meeting with some success, it is true that most builders are reluctant to
ove ahead with passive designs and products without some kind of financial
ncentive to compensate them for the considerable expense incurred in designing,
rienting, building, and selling the passive home. A builder must provide a design
hat is both acceptable to the home buyer and provides a significant amount of
indow area and structural mass in a southerly direction. This means in tract
uilding, for example, that planning must start with lot layout, contending with
odes and ordinances, sometimes with side lot design, and in the case of northern
levation on the street side, with additional design so that it will have curb appeal.
hus, it takes a considerable expenditure of resources by the homebuilder before the
ouse is marketable. The passive solar tax credit proposed in this legislation would
ll the need for some financial incentive for the builders to include these designs
nd products.

What will be the benefits of encouraging passive solar designs and products to be
ncluded in homebuilding in America? Immediately, one must consider the energy
avings that can be attained through passive systems, and, if properly designed and
nstalled, this can be substantial. Next, one must also consider the effect that this
an have on other products in the building industry, such as insulation products,
nd active solar products. With a more carefully designed home for energy efficien-
y, it is likely that with the planning for passive solar will come more emphasis on
nergy conservation and on the necessary products for that purpose, such as insula-
on materials, and more emphasis on the natural combination of passive systems
ith active solar systems in the same residential structure. This linkage effect in
he building industry would be helpful to several sectors at once. Also, the stimulat-
ng effect of moving more passive designs and products has a far-reaching effect in
ob creation. This would help relieve some of the pressure being felt in a depressed
ousing industry at present.

Opponents of the theory of using tax credits to achieve energy conservation or
ther worthwhile national goals argue that many of the things for which incentives
re offered would occur in due time without the use of financial incentives. While
his argument, in the case of solar energy, may be true if we wish to adopt a posture
f neutrality on our energy problems, it is also true that in order to accelerate
nergy efficiency, conservation, and a shift to the use of renewable resources, we
ust have workable financial incentives to move our objectives well ahead of the
rdinary course of the marketplace. In short, if we wait until the cost of fossil fuels
eaves the taxpayer in such desperate financial condition that he would readily
ccept alternate fuel sources, we may also find a taxpayer who is moving too late to
void severe financial damage. The spirit of the tax credits as an incentive is to
ove the timetable of the energy conversion many years ahead of the "due date."

While the passive solar tax credit for builders will do much to help the industry
nd the nation, it is not the total answer for financial incentives. The residential
eeds would be served by the 40-percent solar tax credit now in place and the
ddition of this sound provision for passive solar credits, but additional incentives
ill are needed in the business and commercial areas. The recent amendments to
he solar energy business tax credits, now at 15 percent of the total cost, should be
mplemented by the expansion of the present 10-percent investment tax credit to
nclude solar hot water heating and commercial space heating. This addition would
rovide a more realistic package of 25-percent business tax credits to spur solar

conversions in the commercial/business market, where the greatest energy savings can be realized.

In conclusion, Mr. Chairman, we express appreciation for this opportunity to appear before you and explain our reasons for supporting the solar tax credit for builders, and also for the chance to urge future consideration of expanding the business solar tax credits, as well. I will be pleased to answer any questions you may have. Thank you.

The CHAIRMAN. Thank you, Mr. Howe.

Mr. Anderson, did you want to proceed?

STATEMENT OF BRUCE ANDERSON, ON BEHALF OF THE SOLAR LOBBY, ACCOMPANIED BY SUZETTE TAPPER

Mr. ANDERSON. Thank you, Chairman Ullman and members of the committee.

Ladies and gentlemen, my name is Bruce Anderson, and I am here as chairman of solar lobby today. I am really grateful to have this opportunity to testify on strong behalf of the tax credits for homebuilders for passive solar.

You have my printed statement and I won't read it. Instead, I would like to address a few other related topics which I hope will give you some sense of the environment in which we find ourselves today.

I have been involved in solar for 7 or 8 years. I am on the executive committee of the American section of the International Solar Society.

The American section of the International Solar Society is the largest originally technical organization in the country on behalf of solar. It has topical divisions addressing different technologies. The largest membership is passive. For 6 or 7 years the term "passive" has been adopted in the solar community.

Although there are perhaps dozens of technologies and applications in solar, there is none with the stature of passive for being viable, economic, here to stay, and a positive contributor to our energy problem in the short, immediate term.

I can't stress that strongly enough. The solar community in this country regards passive as the most near term, applicable option in solar energy.

We have a large number of us in the solar community who have been working for years attempting to encourage you, the Congress, to give passive some credibility and some support.

There have been many battles fought, and passive has always come out losing. I can't tell you how important it is for the entire solar industry, not just the passive industry. And by the way, I will point out that the passive industry already has two trade associations, and some segments of solar have none.

I can't tell you how important it is for the entire solar industry that these tax credits be passed. However, we only regard those—and when I say "we", I refer to the solar community—as a first step toward support for applicable passive related and energy conserving methods of driving the energy consumption of our houses and other buildings down to realistic, morally sound levels.

There are many ways of approaching this piece of legislation. From our standpoint, we regard your involvement in this in some sense as heroic, and if not heroic at least historic for all the efforts

that have been made over the last several years in attempting to obtain credits and other support for passive.

These hearings today and the possibility of passing this legislation in the forthcoming weeks, unencumbered by other incumbrances that might jeopardize its passage, if it is passed, you and your participation will be regarded as making a major contribution to the forward movement of the immediate use of renewable energy in this country. I would like to salute you for this initiative and to do so also on behalf of solar lobby.

We are in very strong support of this bill, and we look forward to continuing to develop meaningful and effective ways of moving renewable energy forward, both in the rest of the session and in the coming year.

Thank you.

[The prepared statement follows:]

STATEMENT OF BRUCE ANDERSON, ON BEHALF OF THE SOLAR LOBBY

Chairman Ullman, members of the Committee, ladies and gentlemen: I am Bruce Anderson, Chairman of the Board of the Solar Lobby. I am pleased to have the opportunity to appear before this Committee in support of a tax credit to Homebuilders for the construction of residences incorporating passive solar design and building techniques.

The Solar Lobby is a research and advocacy group based in Washington, D.C., supported by contributions from over 35,000 members who believe that an expeditious transition to the use of renewable energy resources, combined with agressive programs of energy efficiency, are the only basis for sound energy policy.

It would seem obvious that one of the first steps in the transition should be to build the most energy efficient buildings we know how. Yet, today, there are workmen out building houses which will require as much as 10 times more energy than would have been necessary had they employed passive solar building techniques. We must change the way we build homes, and we believe we are discussing today will speed that change.

Our housing stock turns over every 50 years. That is, 2 percent of our homes are built each year. This means that even if we started today to build all new housing in the most energy efficient manner, it would take 50 years to have the entire housing stock using the least possible energy. The correlate is that every new house built in less than the optimum manner will be using an unnecessary amount of energy for the next 50 years.

There has been a great deal of discussion, some of it heated, about the most effective way to get more passive solar homes built—a stimulus to the buyer or to the builder. The tax credit we are discussing today is an incentive to the builder. The newly created Solar Bank provides a subsidy to the buyer. Some builders will see a powerful sales tool in being able to tell their prospective buyer that they are eligible for a $5,000 subsidy from the Solar Bank and will forgo the tax credit. Others will take the tax credit. Solar Lobby believes that having both programs in place will result in the construction of more passive solar homes as each builder opts for the stimulus to which he can and will respond.

There is another job which the Solar Bank may be unable to handle. That is providing an incentive to the builder who is developing a large tract. It seems likely that its limited resources will force the bank to set some limit on the number of subsidies a builder can reserve to use as sales tools to his potential buyers. With such a limitation, we would be providing no incentive to the large developer to build passive solar homes.

Finally, there is the matter of the most effective use of the federal dollar. Every passive solar home on which the builder takes the tax credit costs the government up to $2,000. The home on which he forgoes the tax credit in order to use the availability of the Solar Bank subsidy as a sales tool costs up to $5,000. It would seem sound economics to let a $2,000 incentive do the work of $5,000 where possible.

Often we hear conversation about whether or not a builder will "pass through" a subsidy to the buyer. We think it likely that builders price their houses at what consumers will pay for them and that this price is based on costs because other builders with similar costs are competing against him. We have no reason to think that the passive solar housing market will not operate on the same principles.

In summary, we believe that the very important job of changing the way we build our homes will be significantly speeded by the addition of the option of a tax credit to builders for the construction of passive solar residences.

The CHAIRMAN. Thank you very much, Mr. Anderson.

Mr. Sullivan, we would be happy to hear you.

Mr. ANDERSON. Before he speaks, I would like for the record to say that the Solar Lobby has taken this initiative in bringing Mr. Sullivan here as a technical expert.

You have before you a resource which I hope you will take advantage of during these hearings now to ask Mr. Sullivan some of the more difficult, technical questions related to these tax credits.

The CHAIRMAN. Thank you, Mr. Anderson.

Welcome, Mr. Sullivan.

STATEMENT OF PAUL SULLIVAN, ON BEHALF OF TOTAL ENVIRONMENTAL ACTION, INC.

Mr. SULLIVAN. Chairman Ullman, members of the committee, my name is Paul Sullivan, president of Total Environmental Action, Inc., TEA, in Harrisville, N.H.

I am here today acting as a resource, as Mr. Anderson has said. TEA has been very active in passive solar over the last 7 years. It is staffed with 30, supplying services, both in architecture research and information dissemination.

My involvement, and I believe as a resource for you, has been in the development of the method on which this legislation is based.

Specifically, we are the contractors for the solar bank and the development of the methodology and its application there.

Some history that has to do primarily with the solar bank:

A little over a year ago, proponents of the solar bank were faced with a decision as to how to proceed with offering incentives through the bank subsidies, and the dilemma is essentially whether to go with a cost-based approach or some other approach.

In our experience, costs were nontractable and presented all sorts of administrative obstacles and, therefore, we proposed a performance-based approach. That approach is the basis for your legislation.

We believe it offers several advantages, most significantly in terms of simplicity. It requires three items of information, only one of which a builder is not already required through various administrative procedures to supply, and that has to do with the area of the passive system, something that I tried out on my 10-year-old daughter this past weekend, and she was able to do.

The technical basis for the method is that a reasonable passive designer, given a modest amount of time and information such as one contained on a builder's plans, can accurately predict the energy performance or consumption of the passive building.

With that as a basis, the job before us with the solar bank was to come up with a simple method to take all that knowledge that is embodied in a passive engineer's head and make it as simple as possible to perform a similar calculation.

What that comes down to is three items of information:

He needs to know something about the weather, which we can specify by specifying the building's location.

He needs to know something about the building's energy requirements, whether or not it has a passive system on it. That we can break down into two things: the size of the building—the heated floor area—and also the insulation level that is inherent in the building.

Lastly, he needs to know something about passive system performance, which has to do again with both these previous parameters as well as the size of the passive system.

It is, therefore, a relatively straightforward manner to use the recognition criteria which will determine whether or not this person is dealing with a passive system. Once having determined that there is a passive system, he needs to specify the building location—potentially by ZIP code—specify the heated area of the building, and select appropriate insulation factor, and also to supply the passive system size.

The calculation is simple arithmetic easily done on a four-function calculator. One takes the system area, divides it by the floor area of the building times an insulation factor to determine what we have called the passive factor.

In my written testimony I supplied some general descriptions of the passive recognition factors, and I have also supplied the current insulation factor table for the solar bank.

I would like to call your attention to table 3, which is a sample draft table which I took the liberty of coming up with for the tax credit organized by ZIP code. Once having calculated the passive factor F, knowing what ZIP code the building was located in, one could immediately determine what the tax credit would be.

In conclusion, I would like to make two very strong recommendations: one, that the legislation that you are considering specifically make reference to the solar bank. I believe it would be very unfortunate if the methods developed for tax credits and the solar bank were in fact different and, two, that you, I believe, also follow the lead of the solar bank and not too specifically restrict the method, and I believe this was inappropriately done in Senator Hart's amendments earlier this year. The solar bank methodology has undergone and continues to undergo substantial revision in order to implement the goals of the solar bank, and I do not believe at this time that I could make a recommendation as to specific elements of the methodology and would much rather that the committee and Congress state its intent and objectives and lead the development of the explicit methodology as much as possible to regulation.

Thank you very much.

[The prepared statement follows:]

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STATEMENT OF TOTAL ENVIRONMENTAL ACTION, INC.

Tax credits for builders of passive solar buildings may be based on:

- quantifying consumer costs (passive installation costs)
- quantifying societal costs (savings) associated with the energy saved by passive systems.

Based on simplicity, ease of use and societal efficiency, the recommended approach is to quantify the savings associated with the passive solar energy supplied. This approach is the base of the Solar Bank's consideration of passive systems and a tax credit method consistent with the Solar Bank is strongly recommended.

The technical basis for the method is that a solar engineer can very accurately and quickly determine the amount of energy saved by a passive system.

The proposed method starts from the above premise and reduces the analysis to three key analytical variables:

- Weather = f(location)
- Building Load = f(size, insulation level)
- Passive Performance = f(system size, building load, weather)

Therefore, the builder will be required to make one simple determination and supply three items of information:

First - Does the building incorporate a passive system (See Table 1). If yes,

Two - Specify the building location (potentially by zip code).

- Specify the building heated area and insulation level.

- Specify the gross passive system size (only new piece of information required, taking a couple minutes to measure from plans).

To complete a tax credit form, the builder would perform the following arithmatic:

$$\begin{pmatrix}\text{gross passive}\\ \text{system area}\end{pmatrix} \div \begin{pmatrix}\text{heated floor}\\ \text{area}\end{pmatrix} \times \begin{pmatrix}\text{insulation}\\ \text{factor from}\\ \text{Table 2}\end{pmatrix} = \begin{pmatrix}\text{passive}\\ \text{factor}\end{pmatrix}$$

Knowing the passive factor and location of the building, the builder can determine his credit from the tax credit table such as Table 3.

An additional benefit of the tax table is to allow the builder to estimate the best system size for his region.

In conclusion,

- A performance, rather than cost, based method consistent with the Solar Bank is strongly recommended.
- The passive tax credit legislation should specify the policy objectives of Congress, perhaps including the yearly expected total tax credits submitted, but not unnecessarily restrict the flexibility of the method by specifying the method's underlying assumptions.

Two example houses illustrating the five passive recognition factors are attached.

Table 1

Passive Recognition Factors and Explanation

A passive solar building uses the elements of the building to capture, store, and use the sun's energy to provide heat for the building's occupants. The necessary elements, which frequently are part of the building structure, must include the following:

- Solar Collection Area: The solar collection area is a transparent or translucent material on the south side of a building, designed to admit the direct rays of the sun so that they strike the absorber directly. Typically constructed of glass, plastic, or fiberglass in area amounts greater than conventional construction, the most common "collector" is vertical double-pane glass, which must be within 30° if the south. This glazing may also be on a tilted surface such as skylights.

- Absorber: The absorber is a surface that the sun's rays strike and heat. The thermal energy then moves to a storage mass. Typically, the absorber surface is a material which is dark in color and hard with good solar radiation absorption and thermal conduction properties. This surface must be exposed directly to the winter sun. Common surfaces are dark ceramic tile, slate, brick, and concrete. The absorber surface is intimately connected to the storage mass (see below) and usually is the same material.

- Storage Mass: The storage mass holds the heat absorbed and later releases it to where it is needed in the building by means of the distribution system. Frequently the absorber and the storage mass are one and the same. The storage mass is a dense material of sufficient thickness and surface area to store the absorbed solar energy. Typically, Trombe walls are 12" thick with a surface area equal to the collector glass area. Concrete floor slabs of 4" to 6" thick usually have a surface area of three times the collector area. Other materials and configurations are also possible.

- Heat Distribution Method: A clear means of path connecting the storage mass to the habitable areas constitutes a heat distribution method. Sometimes the heat movement is by totally natural means (such as radiation or convection) and sometimes with the assistance of a very small fan or pump. The most common method of distributing heat from the storage mass to the habitable areas is by radiation from the mass to the space. This typically means that the storage mass is within the habitable space. Massive floors and walls, as well as free standing walls or water containers meet this requirement. The other method is by forced convection from a remotely located storage mass (rockbed) to the habitable space with the aid of a fractional horsepower fan.

- Heat Regulation Device: Heat regulation devices control solar heat gain in the building in summer and unnecessary heat loss from the building in the winter. Two requirements are met with these devices. Excessive heat loss in the winter is typically achieved with the use of insulated shutters, drapes, panels or blankets over the collector area at night. Another method is to provide triple glazing for the collector. The second requirement is to prevent excessive heat gain in the summer through the collector. This is accomplished with overhangs, awnings or exterior blinds or shades.

Table 2

Insulation Factors

Building Type	Building Description	Insulation Factor
1	Uninsulated walls and ceilings Single-glazed windows	.72
2	Between Type 1 and Type 3	.56
3	R-11 walls (4-inches insulation) R-19 ceilings (6-inches insulation) Uninsulated basement Double-glazed windows (or single-glazed with night insulation	.39
4	(R-11 + R-4) walls (4-inches insulation + 1-inch polystyrene) R-30 ceilings Uninsulated basement Double-glazed windows (or single-glazed with night insulation)	.30
5	R-19 walls (6-inches insulation) R-30 ceilings (9-inches insulation) Uninsulated basement Double-glazed windows (or single-glazed with night insulation)	.29
6	R-19 walls (6-inches insulation) R-30 ceilings (9-inches insulation R-10 basement/slab (2-inches insulation) Triple-glazed windows or (double-glazed with night insulation)	.20
7	R-24 walls (6-inches insulation + 1-inch polystyrene) R-38 ceilings (12-inches insulation) R-10 basement/slab (2-inches insulation) Triple-glazed windows (or double-glazed with night insulation	.17
8	R-30 walls (9-inches insulation) R-60 ceilings (18-inches insualtion) R-20 basement/slab (6-inches insulation) Triple-glazed windows (or double-glazed with night insulation). Air to air heat exchanger	.11

Note: Do not choose a higher number building type unless all conditions are met or exceeded, e.g., a building with R-19 walls, R-30 ceilings, R-10 basement, and double-glazed windows without night insulation, would be Building Type 5, not Type 6.

TABLE 3

SAMPLE DRAFT TABLE OF TAX CREDIT FOR PASSIVE RESIDENCES

ZIP\ CODE\		F = APERTURE AREA/HEAT LOAD(UA) <0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
610 ROCKFORD	IL	0	510	970	1400	1790	2000	2000	2000	2000	2000	2000
611 ROCKFORD	IL	0	510	970	1400	1790	2000	2000	2000	2000	2000	2000
612 ROCK ISLAND	IL	0	330	610	840	1040	1220	1390	1540	1660	1760	1840
613 LASALLE	IL	0	460	880	1250	1610	1940	2000	2000	2000	2000	2000
614 GALESBURG	IL	0	440	830	1190	1520	1830	2000	2000	2000	2000	2000
615 PEORIA	IL	0	440	820	1160	1480	1770	2000	2000	2000	2000	2000
616 PEORIA	IL	0	440	820	1160	1480	1770	2000	2000	2000	2000	2000
617 BLOOMINGTON	IL	0	410	760	1090	1390	1660	1900	2000	2000	2000	2000
618 CHAMPAIGN	IL	0	350	640	910	1150	1360	1530	1680	1800	1900	1970
619 CHAMPAIGN	IL	0	350	640	910	1150	1360	1530	1680	1800	1900	1970
620 E. ST. LOUIS	IL	0	190	360	490	590	660	700	710	690	650	570
621 ZIP CODE NOT IN USE												
622 E. ST. LOUIS	IL	0	190	360	490	590	660	700	710	690	650	570
623 QUINCY	IL	0	290	530	740	930	1090	1220	1320	1400	1450	1470
624 EFFINGHAM	IL	0	230	420	590	730	840	920	970	1000	1000	980
625 SPRINGFIELD	IL	0	250	450	630	780	920	1030	1120	1180	1220	1230
626 SPRINGFIELD	IL	0	250	450	630	780	920	1030	1120	1180	1220	1230
627 SPRINGFIELD	IL	0	250	450	630	780	920	1030	1120	1180	1220	1230
628 CENTRALIA	IL	0	180	310	420	500	550	570	570	550	500	430
629 CARBONDALE	IL	0	170	300	400	460	490	490	460	400	310	200
630 SAINT LOUIS	MO	0	200	370	510	620	710	760	790	790	750	690
631 SAINT LOUIS	MO	0	200	370	510	620	710	760	790	790	750	690
632 ZIP CODE NOT IN USE												
633 ST. CHARLES	MO	0	200	370	510	620	700	750	770	760	720	640
634 HANNIBAL	MO	0	290	540	760	960	1130	1270	1380	1460	1520	1550
635 KIRKSVILLE	MO	0	340	630	900	1130	1340	1510	1660	1780	1860	1920
636 FLAT RIVER	MO	0	230	400	560	680	760	810	840	830	800	740
637 CAPE GIRARDEAU	MO	0	110	190	250	280	280	250	200	110	0	0
638 SIKESTON	MO	0	20	10	0	0	0	0	0	0	0	0
639 POPLAR BLUFF	MO	0	100	180	220	210	180	110	0	0	0	0
640 KANSAS CITY	MO	0	170	310	410	500	550	570	570	530	450	350
641 KANSAS CITY	MO	0	170	310	410	500	550	570	570	530	450	350
642 ZIP CODE NOT IN USE												
643 ZIP CODE NOT IN USE												
644 ST. JOSEPH	MO	0	120	210	260	300	330	350	350	330	290	240
645 ST. JOSEPH	MO	0	120	210	260	300	330	350	350	330	290	240
646 CHILLICOTHE	MO	0	300	560	770	960	1120	1250	1350	1420	1460	1470
647 HARRISONVILLE	MO	0	150	270	360	430	460	460	430	360	260	130
648 JOPLIN	MO	0	330	600	810	950	1020	1020	960	860	710	540
649 ZIP CODE NOT IN USE												
650 JEFFERSON CITY	MO	0	190	340	470	560	620	650	650	620	570	490
651 JEFFERSON CITY	MO	0	190	340	470	560	620	650	650	620	570	490
652 COLUMBIA	MO	0	260	480	670	830	960	1060	1130	1170	1190	1180
653 SEDALIA	MO	0	130	240	320	370	380	380	340	280	190	70
654 ROLLA	MO	0	120	210	280	330	350	340	310	250	170	60
655 ROLLA	MO	0	120	210	280	330	350	340	310	250	170	60
656 SPRINGFIELD	MO	0	280	510	720	900	1040	1150	1220	1250	1240	1190
657 SPRINGFIELD	MO	0	280	510	720	900	1040	1150	1220	1250	1240	1190
658 SPRINGFIELD	MO	0	280	510	720	900	1040	1150	1220	1250	1240	1190
659 ZIP CODE NOT IN USE												

INPUT ASSUMPTIONS: DIRECT GAIN WITH R-4 RIGHT INSULATION
COOLING LOAD (HAND,SHADED) SUBTRACTED FROM PASSIVE CONTRIBUTION
CONVENTIONAL SOUTH-FACING WINDOW AREA= 90. SQ FT
10^6 BTU SAVINGS VALUED AT $ 250.

Examples of How Recognition Factors are Used

The following two example house illustrate the five passive recognition factors. The Kelbaugh house has a Trombe wall and greenhouse passive system. The Balcomb house has a sunspace with remote rockbed.

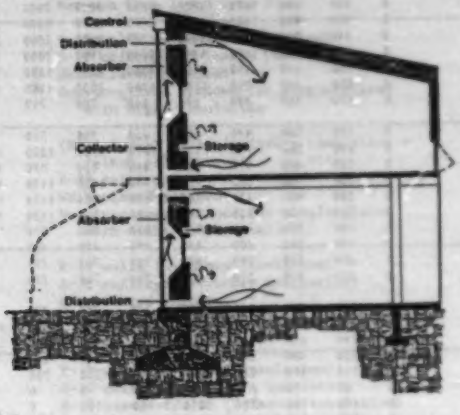

Figure 1 Kelbaugh Residence

Doug Kelbaugh, Kelbaugh and Lee Architects
Princeton, New Jersey

System Description: Combination of Trombe wall and greenhouse, storage in concrete wall, water drums, and masonry floors.

The Kelbaugh residence is one of the earliest examples of a residential Trombe wall application in this country, and is notable for its excellent performance in a location with only moderate winter sun.

The two-story Trombe wall and attached greenhouse occupy the entire south side of the three-bedroom home. Sunlight passes through double glazing and strikes the black-painted concrete Trombe wall.

The space between the two is heated, pulling cool air through bottom vents as war air is released to the house through upper vents on both floors. All three bedrooms upstairs are lined against the wall, and small glazed windows in the wall allow light to enter rooms on both levels. The downstairs is an open plan of kitchen, dining and living spaces.

The greenhouse is open to the first floor's kitchen/dining area through a wide arched passage, and is used primarily for growing plants. Heat is stored in the concrete floor (which is also the ceiling of the cellar below) and in eight 55-gallong water-filled drums.

The passive recognition factors are assigned in the following manner for this house as shown on the accompanying figure. The collector area in this case is vertical double glazing. The absorber is the black painted surface of the Trombe wall behind the collector. Storage mass is attached to the absorber and is the concrete Trombe wall. Other mass is the masonry floor and water containers. The heat distribution method for this system is by radiation and convection off the Trombe wall. The inside surface of the wall radiates directly to the space. Also air rises by convection between the glazing and the Trombe wall which enters the space at the top of the wall and returns at the bottom.

The heat regulatory devices for this house are a series of movable insulation shutters for the windows to prevent excessive heat loss at night and several summer glazing vents at the top of the collector to prevent excessive summer heat gain.

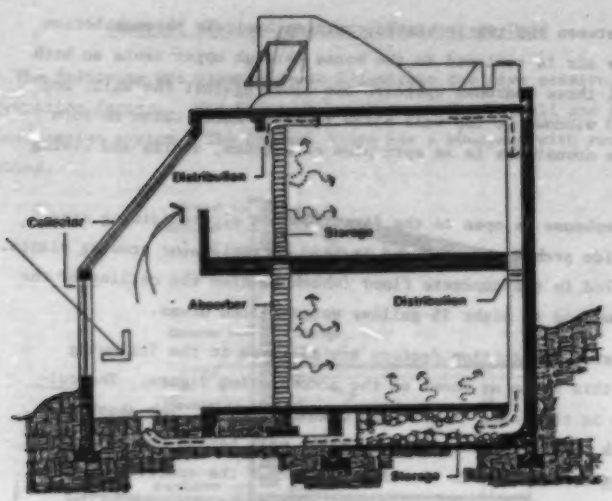

Figure 2 Balcomb Residence

Susan Nichols, William Lumpkins Communico
Santa Fe, New Mexico

System Description: Direct gain through two-story sunspace, storage in adobe walls and two rock beds.

The Balcomb home is one of the earliest and better documented of the passive buildings designed since the mid-70s. Completed in 1976 as a HUD Cycle 1 project, it has been "monitored" by its owners in terms of its comfort and effect on lifestyle; has been metered for heating performance by the electric utility; and is fitted with sensors measuring temperatures throughout the building.

The entire house surrounds a two-story sunspace, separated from the main living spaces by adobe walls on both levels. Sun entering the sunspace heats the air and strikes the adobe walls, warming their exterior surface to well over 100°F on clear days. Temperature sensors have indicated that the heat takes approximately 7 to 8 hours to travel through the wall and radiate to the rooms behind--ideal for meeting nighttime heating needs.

Heated air in the sunspace rises to the top and is pulled through separate ducts to two rock beds—one 14 and the other 11 cubic yards. Heat is absorbed by the rocks and the air is returned to the sunspace. From the rock beds, heat radiates to the living areas above.

Each of the three bedrooms, living room and dining room has doors which open into the sunspace, permitting the flow of warmed air directly into the house. The sunspace temperature is allowed to drop in the evening to uncomfortably low levels, although heat stored in the floor is adequate for plants. No night insulation is used.

The passive recognition factors for the Balcomb house are identical as follows with the accompanying figure. The collector is both vertical and sloped double glazing. The absorber is the outside surface of the dark adobe mass wall which separates the sunspace from the house proper. The storage mass for this house is the adobe mass wall and a rock bed storage unit under the house. The heat distribution method is by radiation off the back surface of the adobe wall, as well as air flow through the rock bed to the sunspace by a small fan. The heat regulatory device is a summertime ventilation system to prevent excessive heat gains.

[The following was subsequently received:]

TOTAL ENVIRONMENTAL ACTION, INC.,
Harrisville, N.H., September 12, 1980.

COMMITTEE ON WAYS AND MEANS,
House of Representatives,
Longworth House Office Building,
Washington, D.C.

DEAR CHAIRMAN ULLMAN AND MEMBERS OF THE COMMITTEE: Thank you for the opportunity to testify on September 8, 1980 regarding tax credits for builders of passive solar residences (H.R. 7690). In preparing my testimony I did not have available to me a copy of the proposed legislation. I have now had an opportunity to review the proposed legislation and I would like to make the following comments. I regard comments four and five as substantive while the others are more clerical.

(1) Subparagraph c.4.B, page 4 line 12.—In referring to the plane of the "solar collection area," the legislation refers to this plane being changed. I would suggest that the words "be changed" be deleted and the word "range" be inserted. This should clarify that the plane of the collertion area is generally fixed (would not be changed) but rather can take any position from vertical to horisontal.

(2) Subparagraph d.1.B, page 7 lines 13 and 15.—The basis for insulation factors is not all inclusive and the specification of eight categories of insulation may be inappropriate. With regard to the basis for the insulation factors, I would suggest adding the word ". . . based on, among other things, the amounts * * *". In any case, the amount of insulation around basements and slabs, the use of movable insulation on windows, and infiltration levels, should be included. With regard to eight categories of insulation levels, I would suggest adding the words "* * * for approximately eight categories * * *". The solar bank presently anticipates using eight categories but has given serious consideration to as few as six and as many as nine.

(3) Subparagraph d.1.—Prescription of Table. The Committee may wish to specifically reference the Solar Bank regulations if it is your intent to have this legislation consistent with the solar bank.

(4) Subparagraph d.2.B.i. page 8 line 2.—The legislation provides for a credit at the rate of $60 for each one million Btu's saved annually. This $60 figure was originally used by Senator Harts previous legislation to represent 20 percent of $300/MMBtu's worth of energy. The $300/MMBtu level was originally used by the Solar Bank as representation of both the worth of energy and an approximation of actual installation costs. (The figure now used is $500/MMBtu). In light of this sessions passage of a 40 percent tax credit for active systems up to a total of $4,000, the Committee may wish to change the $60/MMBtu to $120/MMBtu and may wish to further consider increasing the $2,000 limitation to $4,000. This would give equal tax status and credit to both active and passive systems.

(5) Subparagraph d.2.B, page 8, lines 13 and 16.—The legislation now only addresses heating requirements and ignores the potential increased cooling loads that passive systems impose on buildings. This is significant oversight that should be corrected. The inclusion of passive systems along the Gulf Coast will offset minor heating loads but will increase cooling loads so significantly as to increase the annual energy consumption of the residence. The Solar Bank regulations include consideration of cooling loads in the development of the loan tables.

I would suggest the following changes "* * * required to provide heating and cooling to a reference * * *" and "* * * required to heat and cool a similar * * *".

Again, thank you for the opportunity to testify on this important legislation.

Sincerely,

PAUL W. SULLIVAN, *President.*

The CHAIRMAN. Thank you, Mr. Sullivan.

I am still troubled by the fact that the bill before us is limited pretty much to spec builders who are building for speculation, they have to have a proprietary interest?

Mr. SULLIVAN. Yes; that is true.

The CHAIRMAN. What percentage of new homes are built in this way; do you know?

Ms. TAPPER. I believe 60 percent of the new homes.

The CHAIRMAN. Sixty percent?

Mr. Sullivan, you are recommending that we be purposely less specific and allow regulations to determine the particulars. In the tax code it is very difficult to do that.

The solar bank can do it, but as I go back home one of the biggest problems I find is that people think that the regulators are running the country, and that the Congress has abandoned its responsibilities in order to draft the laws the way we intended them.

I am very leery about using that technique in tax matters. But before we get to that let us discuss the issue of retrofit, Mr. Howe. You suggested that there ought to be some coordination between this and the passive credit already offered to homeowners.

Is there any reason why passive should not be an option insofar as the development to the retrofit application of solar energy is concerned?

Mr. HOWE. Well, if I might respond to that, I certainly think it should be an option, and I think it is clear that the Congress has made it applicable in the tax credits where the credits are applicable for both passive and active systems, and that certainly would be true for new or old construction for retrofit or on new construction.

The problem that we get into in making the retrofit passive systems applicable or eligible for the tax credits is the structural components rule that the Internal Revenue Service has written in the regulations which, of course, limits the application of passive solar systems or designs to virtually nothing, because you really get into just about everything being a part of the structural component of the building.

It seems to me that that ought to be interpreted much more narrowly and would give an opportunity for the will of the Congress, as I read it, to be implemented in allowing these credits to be given to people for passive retrofit.

The CHAIRMAN. We can in this legislation, of course, change the law and mandate different procedures for the IRS. Mr. Sullivan, you are the technical expert. I remember that you opted for us not being too specific. Would it be workable to use the criteria in H.R. 8019, the five basic criteria, and the heat criteria that you have referred to in making passive solar retrofit an option for the credit now in existence.

Would that be feasible?

Mr. SULLIVAN. It is feasible and not only feasible but administratively and technically trivial. It is a very minor additional step to the calculation.

If I could explain it to you, the way it would be done is, the problem that is facing new housing, as far as this method is concerned, is the establishment of a base case in the legislation.

In the legislation that base case is specified as a 1,500 square foot given insulation building. In the retrofit the need for the artificial establishment of that base case is obviated because we have an existing building to start with.

We know what the insulation configuration is, the square footage, and you can take the next step, I know what the passive factor is today and that after the passive modification to that building I wind up with a different factor. The difference in the tax credit

between the two factors would be the allowed tax credit for retrofit.

One needs to do the calculation twice, before and after, and have a very reasonable estimate of the energy—and tax credit—that would be saved by that retrofit. So, as far as the administrative details the method is amenable to that. The procedure that we are using in the solar bank is the same technical basis.

Mr. Anderson, do you have any comment?

Mr. ANDERSON. Yes; I do.

We are personally very delighted that you are concerned about the retrofit. We do have 60 million plus residential units in this country. We do need to retrofit them.

I think the concern from the solar lobby's standpoint is whether or not this piece of legislation is the proper place to demonstrate that concern.

As Mr. Howe has pointed out, the present tax credit structure was intended, at least by some Members of Congress, to include passive more broadly than IRS regulation has interpreted it, as one place to pursue it further.

At the same time the solar bank is presently in the formulation of regulations, and the present direction that those regulations are moving would include retrofit.

A piece of legislation such as this one for homebuilders was drafted particularly for homebuilders. If we encumber this or in other ways detract from its impact addressed to homebuilders, we might not have the positive impact that we would like, and there may be cause to pursue some of those other avenues instead, but we are very much in support of passive retrofit.

The CHAIRMAN. I thank you very much.

I have to handle a bill on the floor and will turn the chair over to Mr. Cotter.

Mr. COTTER. I have a question I would like to pose. What troubles me, and I am a supporter of solar energy, is why it is necessary to give a builder a tax credit, because any solar equipment which is installed in a house or any home built to solar requirements, the cost is ultimately going to be passed on to the consumer, and the consumer already has a tax credit available.

Mr. HOWE. Well, let me try to add something, and I am sure these other gentlemen might want to clarify it.

The fact is that, it seems to me, if the Internal Revenue Service had properly implemented what I read to be the intent of the Congress and the tax credits you would have a lot more emphasis on passive because the rules would have been more applicable for taxpayers to take a tax credit for passive solar designs in their homes.

The rulings that have come down from the Internal Revenue Service in terms of their regulations on specific matters have limited the application of the tax credits, almost so that there is no applicability to passive solar systems.

It is nearly all applicable on the active solar system side, so that things that we are talking about today which are designs in the structure itself have really not been given, I think, the recognition by the IRS in the application of the tax credits, thus there has

really never been any stimulation for passive solar designs to be included in the tax structure.

The taxpayer seems to be frustrated when he asks about it. The Internal Revenue prints in their documents that the tax credits are applicable for both active and passive systems, but it just does not work out that way.

The building community is really not going to take the initiative to put passive designs into homes unless they feel there is a market out there for it, and you might say, well, why isn't there a market if it is that energy efficient? Can't people be sold on that? Well, yes, sir, I think they can be eventually.

We are really talking about something very much in its beginnings, and we need to have some opportunity of showing those kinds of things by way of some visibility in the marketplace, if you will, with some of these homes that have attractive passive designs, and I think that would do it.

Mr. COTTER. In a sense aren't we double dipping in that the builder is taking a credit and he is passing on to the buyer of the home the additional cost of meeting the solar requirements and then the purchaser is also taking a credit?

Supposing we were to remedy the existing law to take this regulatory authority away from the IRS and specify by law that passive solar installation would be eligible for the credit just as someone installing this equipment in his house would be.

Mr. HOWE. You would have some additional incentive in the marketplace to do that. I am not sure whether or not that would be an incentive in the building industry to do it. We are talking here of specific tax credit which the builder gets, and then may pass through to the ultimate purchaser in terms of lower costs or higher fuel efficiency or some other argument in the sale of the house, but that is an option that the committee could look at.

Mr. Fisher, any questions?

Mr. HEFTEL. The pattern of the past tells us that what we are doing is not working, Mr. Chairman.

Mr. COTTER. I can see that.

Mr. HEFTEL. To say that what we have should work begs the issue; it doesn't.

Double dipping is precluded in the legislation so that that is not a factor to be concerned with.

The fact remains that 60 percent or more of all the homes are not custom built. The initiative must come from the builder. The builder must have an incentive to take the risk of building in a higher cost for a buyer who will ultimately in 6, 7, or 10 years recoup the added expense, and you have to start the process somewhere.

I think it is unfortunate that the original legislation has been misinterpreted by IRS so that we are not getting the impact that was intended, and I would like to ask the chairman if he is aware of the dialog that took place at the time the legislation was drafted, as to whether or not the IRS has gone in the direction contrary to what is intended.

Mr. COTTER. I think this would very well be the case, knowing the IRS. My sympathies are with Chairman Ullman, and I feel we have given too much regulatory authority to many of those agen-

cies who do not respect the intent of Congress. They have enacted many regulations which have frustrated businessmen such as ourselves as legislators.

Mr. HEFTEL. Perhaps there are two factors that ought to be considered. First, whether the intent of the Congress has been aborted by the IRS regulation of the solar bank and, if so, by what specific amendment to that legislation, and, second, whether we should go forward with this legislation on the theory that it is needed, if we are going to get initiative out of the industry itself, and 60 percent of the homebuilding encompassed in that group. I certainly appreciate your participation and the information that you have provided us with.

Thank you very much.

Mr. COTTER. Thank you very much, gentlemen.

It was very informative. We appreciate your testimony.

The next panel will consist of Mr. Paul Warner, representing the National Fenestration Council; Mr. DeLaquil, representing the Architectural Aluminum Manufacturers Association; Ms. Dotseth, representing Passive Solar Products Association; and Mr. Pierce, representing Northeast Retail Lumbermens Association.

Mr. Warner, you will be the leadoff witness.

Chairman Ullman asked me to apologize for his having to leave. There is a bill on the floor coming out of the Ways and Means Committee. It is imperative that he be there. Hopefully, he will return before your testimony is concluded, but he asks that I extend his personal greetings to you.

You may proceed.

STATEMENT OF PAUL WARNER, VICE PRESIDENT, VIKING INDUSTRIES, PORTLAND, OREG., ON BEHALF OF THE NATIONAL FENESTRATION COUNCIL

Mr. WARNER. Mr. Chairman, members of the committee, I am Paul Warner. I am speaking as a board member of the National Fenestration Council, NFC.

I am vice president of Viking Industries of Portland, Oreg., and also president of the Sealed Insulating Glass Manufacturers Association.

The NFC is pleased to confirm its support of tax credits for passive solar design in residential construction, and submits the following comments.

The NFC is a nonprofit corporation representing the fenestration industry and which provides products such as doors, windows, and skylights to homebuilders and the construction industry.

NFC is comprised of both large manufacturers and many small and medium-sized firms which provide fenestration products at the local level.

The NFC recognizes our Nation's need to conserve fossil fuels and better utilize our renewable resources.

The NFC is sponsoring the following specific research efforts consistent with its commitment to greater use of renewable resources:

A research associate program at the National Bureau of Standards related to the development of means for predicting the utiliza-

tion of daylight and the attendant savings in electricity for artificial lighting.

A computer study to predict the effect of windows on energy use in residences, and ultimately design aids to assist builders in optimizing window usage in homes.

As homes and buildings are constructed and modified to utilize renewable resources, our Nation's energy dependence will be reduced as will the inflationary impact of the foreign energy.

Further, use of solar designs in the construction sector creates noninflationary jobs in local markets and reduces environmental pollution.

We would urge one technical change in the legislation in order to avoid a possible misinterpretation relating to the storage mass.

Section 44F(c)(6)(D) should be changed to read "has an area of directly irradiated material (that is floors, walls, etc.) equal to or greater than the solar collection area."

The reason for the suggested change, the addition of the phrase in parenthesis, is to avoid any misinterpretation of the term directly irradiated material.

Passive solar design makes economic sense today and often passive solar systems will pay for themselves over the course of just a few years.

However, it does cost the builder considerable expenditure of resources to design and build passive solar houses, especially in terms of lot reorientation, moving a substantial portion of the windows and glazing area to the south side of the house, and providing a house design which homebuyers will accept.

It is because of this that many builders and developers, who must compete in an extremely tight capital market, are often reluctant to alter traditional home designs in any way which increases the costs, and an economic incentive such as the passive solar tax credit is necessary to move homebuilders in any significant numbers to provide passive solar houses in the marketplace.

This passive solar tax credit, which the National Fenestration Council supports, addresses this problem by providing the necessary incentive to builders of new homes to incorporate passive design.

Thank you.

Mr. COTTER. Thank you very much, Mr. Warner. I am certain the committee will take into consideration your suggestion as we go to mark up the bill.

Our next witness will be Mr. DeLaquil, representing the Architectural Aluminum Manufacturers Association.

Mr. DeLaquil, you may proceed.

STATEMENT OF PASCAL DeLAQUIL, JR., ON BEHALF OF THE ARCHITECTURAL ALUMINUM MANUFACTURERS ASSOCIATION (AMCOR INDUSTRIES, INC., DELMONT, PA.), ACCOMPANIED BY EDWARD HAGGARTY

Mr. DELAQUIL. We would like to thank you, Mr. Chairman, and the members of this committee, for the opportunity to express our views on passive solar tax credit legislation.

I am Pat DeLaquil, president of Amcor Industries of Delmont, Pa. My company is an aluminum window manufacturer.

I am speaking to you today as the volunteer, elected president of the Architectural Aluminum Manufacturers Association. I am joined by Edward Haggarty, our executive vice president, and chief staff officer.

AAMA is a national nonprofit trade association, headquartered in Chicago, Ill. The association is comprised of 250 member companies involved in the manufacture of architectural aluminum components for both residential and commercial buildings.

Approximately 70 percent of our membership are manufacturers. The balance are suppppliers to the industry. Approximately 70 percent of the manufacturing member firms are small to medium-sized businesses. The lion's share of the products produced by our membership are glazing systems that are basic to passive solar energy utilization.

AAMA is highly committed, through technical research, development of voluntary standards and consumer and industry education efforts to help conserve the Nation's energy resources. This dedication to energy efficiency has launched our association's intense efforts in assisting architects and builders in the practical application of passive solar design.

As an active participant in the emerging passive solar industry, we fully endorse legislation to establish a passive solar tax credit. We also commend your leadership and farsightedness for considering this legislation at a time of serious energy conservation and economic problems.

These problems underscore the need to stimulate a beleaguered building industry. We feel the legislation under consideration will contribute positively toward reducing the Nation's dependence on foreign energy sources and improving the climate for new home starts.

Our reasons for supporting the proposed legislation are many. We endorse the effort of providing incentives for use of renewable energy resources to help reduce our Nation's dependence on fossil fuels. Passive solar systems represent the most cost effective and easily applied technology for the heating and cooling of homes.

Passive solar is a proven technology. For example, new homes can be constructed with larger proportions of glazing on southerly oriented exterior walls, and with eaves placed to block out the direct rays of the high summer sun while admitting the low winter sun to heat the structure.

Such techniques may be implemented without having to depend on mechanical systems.

The only missing ingredient has been quantified design data to allow architects and builders to optimize building designs for maximum beneficial passive solar utilization.

AAMA has contributed to the effort to provide such design tools to enable the builder to take full advantage of practical passive solar techniques that are highly efficient in cost payback.

We support this legislation because the building industry needs the incentive to incorporate passive solar designs. Despite the obvious economic advantages of passive solar, these savings accrue to the homeowners, not to the builders.

In addition, builders and developers who must compete in an extremely tight market for investment capital are understandably

reluctant to make any addition to a home which might add to its cost, or which might call into question its acceptance by the public or mortgage lending institutions.

The proposed legislation will provide builders with the needed incentive to overcome these obstacles and spur the growth and commercialization of the passive solar market.

In this regard, AAMA sponsored research aimed at quantifying available solar heat gain and developing design techniques to allow optimization of passive solar systems.

One result of this documented research is a recent AAMA publication entitled "Energy Efficient Windows" which introduces the concept of solar gain factors and their use in modifying conventional heat conduction U-values.

Another publication, "Estimating Window Management Savings," provides homeowners with a simple method to estimate potential heating and cooling energy cost savings possible through improved management of windows via draperies, shades and the like.

We have also produced a methodology for determining effective annual energy balance of roof-mounted skylights which takes into account the effects of solar gain and of daylighting in supplanting electric lighting. We are submitting these materials for the record.

These efforts of AAMA, and those of other industry associations, are of course complementing the pioneering work of the Departments of Energy, Housing and Urban Development, and Commerce, for example, in providing sound passive solar design data.

In short, gentlemen, the methodology exists, the technology is proven, and the needs for energy savings and incentives for the building community are clear.

For these reasons, we support H.R. 8019 and urge its passage and implementation.

Gentlemen, either I or Mr. Haggarty, my designated representative, will be happy to assist you in any way possible.

[The prepared statement follows:]

STATEMENT OF PASCAL DELAQUIL, JR., ON BEHALF OF THE ARCHITECTURAL ALUMINUM MANUFACTURERS ASSOCIATION

We would like to take this opportunity to thank Chairman Ullman and the members of this Committee for the opportunity to express our views on Passive Solar Tax Credit legislation and specifically H.R. 8019.

I am Pat DeLaquil, President of Amcor Industries of Delmont, Pennsylvania. My company is an aluminum window manufacturer.

I am speaking to you today as the volunteer, elected President of the Architectural Aluminum Manufacturers Association (AAMA). I am joined by Edward Haggarty, our Executive Vice-President and Chief Staff Officer, Jack Roehm, our Technical Director and Robert Schuckman of Jenner & Block.

AAMA is a national non-profit trade association, headquartered in Chicago, Illinois. The association is comprised of 250 member companies, involved in the manufacture of architectural aluminum components for both residential and commercial buildings. In the building industry, AAMA is regarded as the main source of technical research and information and consumer education on architectural aluminum and its uses in commercial and residential building. AAMA is also the vehicle for establishing industry-wide voluntary performance standards for aluminum building products.

Our membership is organized into six divisions by product types—residential windows and doors, patio doors, storm windows and doors, skylights and space enclosures, commercial windows, store fronts and curtain walls, mobile home components and residential sheet products.

Approximately 70 percent of our membership are manufacturers. The balance are suppliers to the industry. Approximately 79 percent of the manufacturing member firms are small to medium-sized businesses.

The architectural aluminum industry makes a major contribution to the total fenestration or glazing industry. That industry contributes approximately $10 billion in value added goods and services to the annual GNP, and provides employment for approximately a half million people.

The lion's share of the products produced by our membership are key elements of glazed components and glazing systems for buildings. Glazing systems, in turn, are major elements or the "valves" of even the most basic passive solar energy utilization systems.

AAMA is highly committed, through technical research, consumer and industry education efforts to help conserve the nation's energy association's intense efforts in assisting architects and builders in the practical application of passive solar design. These efforts have include development of simplified design techniques and energy balance analyses of glazed systems including solar effects and consumer education on the energy saving potential of sound window management principles.

As an active participant in the emerging passive solar industry, we fully endorse legislation to establish a Passive Solar Tax Credit. We also commend your leadership and farsightedness for considering this legislation at a time of serious energy conservation and economic problems. These problems underscore the need to stimulate a beleaguered building industry. We feel the legislation under consideration will contribute positively toward reducing the nation's dependence on foreign energy sources and improving the climate for new home starts.

Our reasons for supporting the proposed legislation are many. First, we endorse the effort of providing incentives of use of renewable energy resources to help reduce our nation's dependence on fossil fuels. Passive solar systems represent the most cost-effective and easily applies technology for heating and cooling of homes.

Estimates of government agencies indicate that a substantial amount of home heating requirements, depending on geographic location and climate, can be met with passive solar techniques.

Passive solar is thus a sound investment for today which will reap additional benefits as the cost of fuels continues to rise. Furthermore, passive solar is a proven technology. For example, new homes can be constructed with larger proportions of glazing on southerly-oriented exterior walls, and with eaves placed to block out the direct rays of the high summer sun while admitting the low winter sun to heat the interior. Such techniques may be implemented without having to depend on mechanical systems.

The only missing ingredient has been quantified design data to allow architects and builders to optimize building designs for maximium beneficial passive solar utilization. AAMA has contributed to the effort to provide such design tools to enable the builder to take full advantage of practical passive solar techniques, that are hightly efficient in cost payback.

Moreover, we support this legislation because the building industry needs the incentive to incorporate passive solar designs. Despite the obvious economic advantages of passive solar, these savings accrue to the homeowners, not to the builder. In additon, builders and developers, who must compete in an extremely tight market for investment capital, are understandably reluctant to make any addition to a home which might add to its cost, or which might call into question its acceptance by the public or mortgage lending institutions.

The proposed legislation will provide builders with the needed incentive to overcome these obstacles, and spur the growth and commercialization of the passive solar market.

It is true that use of glazing to act as solar collection devices, has been an intuitive concept, which architects have long translated into a subjective preference for southerly exposures. However, this techique has been factored into engineering planning or quantitative data. Recent energy conservation concerns have provided impetus to development of a scientific approach to passive solar design.

In this regard, AAMA sponsored research aimed at quantifying available solar heat gain and developing design techniques to allow optimization of passive solar systems. One result of this documented research, is a recent AAMA publication entitled "Energy Efficient Windows" which introduces the concept of solar gain factors and their use in modifying conventional heat conduction U-values. This takes into account the quantitative effects of solar heat gain for use in the design and planning of homes with optimal window placement and orientation.

Another publication, "Estimating Window Management Savings", provides homeowners with a simple method to estimate potential heating and cooling energy cost

savings possible through improved "management" of windows via draperies, shades and the like.

We have also produced a methodology for determining effective annual energy balance of roof mounted skylights which takes into account the effects of solar gain and of daylighting in supplanting electric lighting. We are submitting these materials for the record.

These efforts of AAMA, and those of other industry associations, are of course complementing the pioneering work of the Departments of Energy, Housing and Urban Development and Commerce, for example, in providing sound passive solar design data.

In short, gentlemen, the methodology exists, the technology is proven, and the needs of energy savings and incentives for the building community are clear.

For these reasons, we support H.R. 8019 and urge it's passage and implementation.

Gentlemen, either I or Mr. Haggarty, my designated representative, will be happy to assist you in any way possible.

The CHAIRMAN. Thank you, Mr. DeLaquil.

Ms. Dotseth.

STATEMENT OF MAXINE DOTSETH, ON BEHALF OF THE PASSIVE SOLAR PRODUCTS ASSOCIATION, ACCOMPANIED BY JOHN SCHNEBLY, THERMOTECH CORP.

Ms. DOTSETH. Mr. Chairman, members of the committee, my name is Maxine Dotseth and I am the executive director of the Passive Solar Products Association.

I welcome the opportunity to appear before the committee today on behalf of industry firms who design, manufacture and distribute passive solar products.

Accompanying me today is John Schnebly, PSPA industry chairman and president of Thermotech Corp., a passive solar product development firm.

It is the intent of this testimony to voice support for a builder's tax credit for passive solar design and products.

The passive solar industry has developed cost effective and reliable approaches to solar heating and energy conservation.

The industry firms who have pioneered some of these efforts are looking toward new energy directions for this Nation and the development of joint marketing efforts to reduce energy consumption.

The formation of the Passive Solar Products Association was an initial industry effort to meet this need by providing a forum for further development of passive solar design and products.

In 1979, the Industrial Textile Research Division of the Canvas Products Association International invited a number of passive solar industry representatives to their technical and marketing seminar.

Solar industry leaders met with industrial textile producers to acquaint them with new opportunities for their industry. Canvas Products Association International represents firms in the industrial textile, film, hardware and fabrication technology markets.

From the contacts made during this seminar, plans were set to form a division of CPAI called the Passive Solar Products Association.

During the past year the association has grown in size and outreach to further develop the markets for passive solar design and products. We have formed alliances with many of our colleagues in the window, masonry, building and design industries. We have become a diversity of business entities that are pursuing

product developments. These developments can provide alternatives to our Nation's energy dilemma.

Public reaction to energy-independent homes is positive and growing. Many articles on the cost-effective features of passive solar design have appeared in leading business and trade publications this past year.

In many parts of the country this simple and energy efficient technology is considered to be the commonsense approach to heating homes.

The Solar Energy Research Institute in Denver recently offered passive solar design assistance to homebuilders. Three hundred participants, including the Homebuilder's Association of Denver, attended the introductory seminar. Clearly the level of response and awareness was high.

Although architects have proven that energy efficient homes can be designed, the building industry in general is reluctant to take the risk necessary to apply passive solar technology. Only those consumers who can afford a custom-built home can venture into new energy designs at this time. A tax credit for a builder who incorporates passive solar design would produce three immediate results:

First. The proposed legislation would stimulate a depressed housing market and provide incentives to the builder for energy design in new home construction.

Second. Energy efficient, cost-effective housing will create an important consumer awareness, an acceptance, as well as a reduction in our dependency on natural gas and electrical energy resources.

Third. Incentives to the construction trades will bring an immediate stimulation to the passive solar products industry. Stimulating market development for this industry will generate the needed capital for a range of new products for the energy prices of the 1980's.

An area of prime concern for PSPA is joint marketing opportunities for our members.

Many passive solar building designs need a variety of individual products to be successful. They need adequate insulation, improved window assemblies, practical thermal storage systems, improved shades, shutters and awnings, and quality construction practices.

Perhaps the largest potential market for our product developers lies in the control of heat gain or loss through the window unit. These products are categorized as heat regulation devices in the legislation.

This market includes both new and traditional products for windows. Adjustable awnings, insulated shades and shutters, solar screens and new window film developments all enhance the energy efficiency of good passive solar design.

For example, in Europe, where energy costs have been taken seriously for years, awnings have undergone sophisticated development with tubular motors and automatic controls that raise and lower the shading surfaces in precise relationship to the weather conditions.

American firms are not only importing this equipment, but also designing second generation combinations of hardware, fabrics and controls from American manufacturers.

With purchase orders from the Nation's builders, our product innovators will be able to produce marketable products. We will be able to finally move many products off the drawing boards, out of the prototype houses, and into the construction, manufacturing, and marketing channels where jobs are created and tax revenues for Government are generated.

Now is the time to stimulate energy efficient housing and products to meet new energy demands of the 1980's. This legislation will allow the products of our industry to be displayed in the showcase homes of the innovative builder. Even those consumers unable to buy a traditional new home will be exposed to the designs and products that will enhance solar collection for their current dwellings.

With the appropriate Government incentives and industry development, passive solar design and products can become common features of buildings both old and new.

In summary, the Passive Solar Products Association believes that it is in the national interest to provide viable energy alternatives, to stimulate new industry growth, and to provide cost-effective solutions to our national energy problem.

Thank you for the opportunity to present our views to you today.

Mr. Chairman, I will be pleased to answer any questions which you or the committee may have.

The CHAIRMAN. Thank you, Ms. Dotseth.

Finally, Mr. Pierce. Welcome.

STATEMENT OF HORACE G. PIERCE, ON BEHALF OF THE NORTHEASTERN RETAIL LUMBERMEN'S ASSOCIATION

Mr. PIERCE. I am Horace Pierce, executive vice president of the Northeastern Retail Lumbermen's Association, with offices in Boston and Rochester, N.Y.

The association is a broad service based trade association representing 1,250 retail lumber and building material firms in New York State and New England and 260 building material wholesalers and manufacturers.

Retail lumber dealers are located in every community and they are major providers of energy conservation devices. Most of the material used in construction of new houses and remodeling projects is handled by these lumber firms. Our members are constantly being called upon to provide information on the use of windows, insulation, weatherstripping, caulking, and other materials. These people serve both consumer and contractor customers.

The industry has been constantly seeking ways to assist the public and Government in making homes more energy efficient.

We have had energy and energy conservation on our convention program in Boston for the past 4 or 5 years. Passive solar does work in the Northeast.

Strangely enough, we did not realize that we have been promoters of passive solar for many years through the use of windows to light and heat houses. We now find that with a little education and the proper location of the house and the type of windows—double

glazing on the south side and triple glazing on the north side—we can make homes more energy efficient

This past spring we conducted 14 dealer training meetings and spoke to 700 lumber dealers on a program called turning windows into profit. There is a great interest in this subject.

Many of our members are working actively with their customers to spread the word of passive solar.

The Northeastern Association has committed itself to an active program in passive solar and energy conservation. We do this with a twofold purpose of, one, to benefit our members and, second, to assist the public.

The Northeastern Association is also a cosponsor of Builders and Remodelers 1980 at the University of Massachusetts which is a training seminar for builders and remodelers on passive solar.

One of our members in Wellesley, Mass., is participating in a pilot program on passiver solar additions to existing lumber dealers' stores to educate graphically to the public the effect of solar energy.

Another one of our members who is chairman of our energy committee from Cooperstown, N.Y., is conducting a pilot program on point of purchase audio visual consumer education on energy conservation and the use of passive solar.

Studies have proven that the Northeast area is a very cost effective area as it relates to the use of passive solar in terms of the high cost of the predominant fuel in this area. These studies are available from well-known research organizations. We are currently working on a major educational program with the Northeast Solar Energy Center in Boston.

The bill you are considering to provide income tax credits to builders for passive solar construction on new houses in our opinion is in the best interest of the Government and public. We urge your support for this legislation which will help encourage construction of new homes in the Northeast. These homes can be built very energy efficient if the proper techniques are used.

Passive solar is relatively simple but it definitely requires changing people's thinking as it relates to esthetics and other matters.

I am not a technician, but I have with me on my left one of our members from Edinburg, N.Y., an area in the Adirondacks. This gentleman has built and sold a number of new homes constructed with the latest passive solar techniques. He has sold homes that require only a minimum amount of fuel to heat the home for the entire winter in the cold northern part of the Adirondacks.

Tomorrow morning he will be speaking to the panel we are holding for the benefit of the House Ways and Means Committee members and staff. If you have any questions, I am sure he would be willing to answer them now as well as tomorrow.

We are also leaving you a copy of the association's official publication, The Lumber Co-Cperator, which gives a verbatim transcript of one of our convention sessions on energy conservation.

You will note that it carries a complete report on the work of our dealer/builder in the Adirondacks. His name is Bruce Brownell from Brownell Lumber and Alternate Energy Sources in Edinburg, N.Y. It is must reading for all.

The tax credit bill you are considering will bring about the use of passive solar construction in new homes. An educational job must be done and the builders is the correct place to put a tax credit. Builders need an incentive to build passive solar homes.

Construction costs are such that it is needed. Builders control construction, particularly in development.

Initial design and construction costs are rather substantial. Builders need help in providing this lead to bring energy efficient homes. Tax credit to builders will speed up the process and the use of passive solar construction.

We thank you for this opportunity to present these remarks. If you have any questions of me or Mr. Brownell, we will be happy to answer them. We urge your approval of H.R. 8019.

[The prepared statement follows:]

STATEMENT OF THE NORTHEASTERN RETAIL LUMBERMENS ASSOCIATION

My name is Horace G. Pierce. I am Executive Vice President of the Northeastern Retail Lumbermens Association with offices in Boston, Massachusetts and Rochester, New York. I reside at 65 East India Row, Boston, Massachuestts.

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Retail lumber dealers are located in every community and they are major providers of energy conservation devices. Most of the material used in construction of new houses and remodeling projects are handled by these lumber firms. Our members are constantly being called upon to provide information on the use of windows, insulation, weatherstripping, caulking, etc. These people serve both consumer and contractor customers.

The industry has been constantly seeking ways to assist the public and government in making homes more energy efficient.

We have had energy and energy conservation on our Convention program in Boston for the past 4 or 5 years. This past January former Secretary of Energy, James Schlesinger, spoke to our group.

We are currently in the process of educating our members and through them to the consuming public on the advantage of passive solar and its use in both new construction and remodeling projects.

Strangely enough, we did not realize that we have been promoters of passive solar for many years through the use of windows to light and heat houses. We now find that with a little education and the proper location of the house and the type of windows (double glazing on the south side and triple glazing on the north side) we can make homes more energy efficient.

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MARCH 1981
THE LUMBER CO-OPERATOR
"Energy and the Lumber Dealer"
BRUCE R. BROWNELL, Adirondack Alternate Energy
CHARLES B. HARTMANN, Owens-Corning Fiberglas
JOSEPH DEVANGE, Northeast Solar Center
JOHN ED RYAN, National Forest Association
See page 16

"Energy and the Lumber Dealer"

This is a transcript from the panel discussion presented at the 86th Annual Convention in Boston, Massachusetts

Moderator:

Richard A. White, president, Bruce Hall Corporation, Cooperstown, NY

Panel Members:

Bruce R. Brownell, President, Adirondack Alternate Energy Div. of Brownell Lumber Co., Edinburg, NY

Charles R. Hartmann, Div. Manager, Residential Insulation Distribution, Owens-Corning Fiberglas Corporation, Toledo, OH

Joseph Levangie, Manager Industrial Development Division Northeast Solar Center, Cambridge, MA

John Ed Ryan, District Manager, National Forest Association, Hoboken, NJ

THE MODERATOR: Good morning. We will be discussing at this morning's breakfast clinic "Energy and the Lumber Dealer." My name is Dick White, Bruce Hall Corporation, Cooperstown, New York.

The purpose of this clinic in the program this morning is to show you how retailers are providing energy conservation products to the consumer and other aids and agencies available to you. Most of you who have attended some of our clinics know how we operate. This morning we have four panel members who will give a short talk, and then at the end we will have an open discussion, question and answer period.

On this morning's panel we have Bruce Brownell, President of Adirondack Alternate Energy, Division of Brownell Lumber Company, Edinburg, New York; Brownell Lumber Company being a member of the Northeastern Lumbermens; Charles Hartmann, Division Manager, Residential Insulation Distribution, Owens-Corning Fiberglas Corporation, Toledo, Ohio; John Ed Ryan, District Manager, National Forest Association of Hoboken, New Jersey.

To start the panel this morning, we have our first speaker who is the Manager of Industrial Development, a Division of the Northeast Solar Center in Cambridge, Massachusetts. He is responsible for coordinating all programs and projects in the northeast region related to market development, financial investment services, engineering and architectural services, institutional and legal areas and incentives. Before joining NESC in February of 1978, Levangie was Director of Communication for the AFCO Corporation. In addition, Levangie worked for the Sperry Rand Corporation where, as Corporate Venture Manager, was responsible for transferring new business ventures from research and development to commercial marketplaces. Levangie received his B.S. in Chemical Engineering from the Massachusetts Institute of Technology, his M.B.A. from the Harvard Graduate School of Business in Business Administration, and in 1975 Levangie, a United States Congressional Intern, authored the reference book "Energy ERDA." Joe will give the solar energy dimension of our program this morning.

JOSEPH LEVANGIE: Thank you.

Good morning, everyone. I would like to thank the NRLA for giving us the opportunity to, in fact, talk about energy. It's an important thing in our economy right now. If it is not the most important problem in the country today, I really don't want to know what it is.

Fifty percent of our oil is imported these days. It costs us $60 billion and rising, and we're not to do today is to put in context the renewable energy source possibility as it pertains to the country, as it pertains to the northeast, and particularly as it pertains to members of the NRLA.

For those of us in the northeast

A report on what [illegible] are doing to provide energy conservation products to the consumer was presented by (l-r) Shuna R. Gruenert, Jorge Del Real, Ch.Ne. A. Hartmann and Joseph Levangie at Northeastern's 69th Annual Convention

pay about 30 percent more for our energy than the national average. Ninety percent of the energy to the northeast is imported. Sixty percent of that is foreign. We have in the northeast about 57 percent of the home heating oil usage in the entire country, so we have a very vested interest in trying to address this problem.

Now how do we cope with this problem? How do we react? Let's put it in context. I would like to cite two references first from the study "Energy Global Perspectives 1985 to the Year 2000." I quote, "The basic danger of the world energy situation is that it could become critical before it seems serious. Most governments and businesses for many legitimate reasons focus their efforts within a time horizon of five to ten years. With such relative shortsight, the energy future does not seem serious. The time for decisive action is now. From the national energy sustained economic growth beyond the year 2000 rests in large measure on the development of renewable and essentially inexhaustible sources of energy. The government should aggressively promote the development of non-conventional resources despite the fact they face many uncertainties. The danger of too much mutual skepticism is it may become a self-fulfilling prophecy."

The warnings, the urges expressed in these statements have been heightened by other voices and other events. Even now in January of 1980 we are experiencing with Iran and possibly with Afghanistan yet again the consequences of our unpreparedness for unexpected interruptions in the availability of our supply of oil. One important governmental response to this has been the creation some two years ago of regional solar energy centers, RSEC. They're funded by the Department of Energy. Their mission is to accelerate the commercialization of solar energy. It's a free resource available to everyone including the people in this room, and the services include a variety of workshops, a whole series of activities that relate to public advocacy of the various solar technologies, business counseling to small companies, to large companies, and market development. The capabilities of an RSEC typically include people who are architects, engineers, bankers, builders, educators, marketers, lawyers and so on.

There are four regional solar energy centers. I'm from the one in the northeast here in Cambridge. There is one in Atlanta, one in Minneapolis, St. Paul, and the other is out in Portland, Oregon. The Northeast Solar Energy Center, NESC, is right down the street on Memorial Drive, 70 Memorial Drive, and we have been in business for over two years. We cover the nine states of the northeast which by our definition include the six New England states and New York, New Jersey and Pennsylvania, which includes about 24 percent of the population of the country and, interestingly, importantly and with some difficulty 86 percent of that population is in a metropolitan area.

We have run workshops for many groups represented here. We have had workshops for builders, for code officials and for architects. Also, we have workshops for other people that impact you. For example, the financial community. We have had a couple of dozen workshops to try and get them enlightened about what solar is and what it is not.

I should also point out that on the top of our roof because our job is to be an advocate, an intelligent advocate of solar, we should practice it and we installed our own hot water system, and we built our own solar greenhouse where there are plants and so on growing right now.

The issue is: Can solar make a contribution? The President back in July set a national goal for the year 2000 of 20 percent solar contribution. The year 2000 is now less than two decades away. What does history tell us? What it tells us is that each energy source has its day. It peaks, plateaus and then phases out, going from wood to coal and now petroleum. So it would be obvious, of course, that solar is next in line, and it can do it. We would take it from there except that solar is a very difficult subject to talk about because of some of the problems, and one problem it has is that it has a bad image. It has an image of impracticality.

Here's a slogan that says, "How many guys do you know with a solar-powered wristwatch?" As you may know, there are solar-powered wristwatches which use photovoltaic or solar cells. They don't work in the

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Energy

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dark, but what they do is have a cell that will keep the life of the regular battery going longer and extend it from one year to maybe three years. But this is an image problem that solar has. I would like to touch upon some of these myths and, hopefully, refute some of them.

The first myth is that solar is a new kind of technology. Well, first of all, there are several technologies, but speaking first to the issue of heating water with the sun, solar has been around for a long, long time. In the 1930's there were literally tens of thousands of solar systems for hot water in Florida and California. Then there was artificially cheap gas and oil that interrupted the growth of those industries. In Israel, Australia, Japan there are millions of solar installations.

It's been said, that solar energy is not for the northeast. That isn't categorically true. The number of installations, for example, for hot water in the northeast have doubled in the last eight or nine months, and we have about 80 percent of the sunshine of the national average. It's bound to work and given that we have extraordinarily high energy costs we, in fact, cannot be choosey. The fact that it can't help much, well, it won't help much if we don't attain our goal. But if we make strives to attain that goal, it will help quite a bit. In fact, what we're talking about between now and the year 2000 is the development of several multi-billion-dollar industries just here in the northeast. The fact is it can be used for both new construction and retrofit, and there are today qualified, competent installers, passive solar designers and other competent solar people in place here in the northeast.

The biggest myth, I guess, is that solar is just flat plate collectors. Now it is true that active solar, as it is called with your solar collector, is here and in certain applications can be a good economic buy. Now passive design is here today. Low heat hydro is here. Of course, we have been burning wood since we landed in this country. Wind photovoltaic and ocean energy conversion are considered solar technologies, but particularly the solar cells in ocean conversion is still a few years off.

I would like to take a quick look in reverse order of possibly NRLA's interests in each of these technologies and focus in on where there might be a fit.

First of all, solar cells are a high technology mistake. They came out of the space program. We're now trying them on rays on the ground. The price has been coming down. These cells convert directly by use of a crystalline material which turns energy into electricity. It's not inconceivable that ten years from now lumber yards might be selling little home packages of solar cells that the homeowner can install himself.

Now wind is considered a solar technology because the sun, in fact, creates the wind. A water pump in Greece that has a design that is over 2,000 years old. This physically is over 450 years old in Holland. In the United States over the past century we have built over six million wind machines. They have been typically used for farm applications. Innertech, a small company growing up in Vermont, built a two kilowatt machine. This is synchronous with home current. They also come in big sizes.

The next solar technology which some people in the government like to call biomass is in its most practical form wood, and we know a lot about wood here in the northeast. In fact, I am sure you all know that the sale of woodburning furnaces is just unbelievable. It's gone up by a factor of five to six in the last year. The resource here in the northeast is considerable. About 60 percent of the northeast is forested, and in the northern tier or the top three states, Maine, Vermont and New Hampshire, are about 80 percent forested. There is more wood rotting on the ground than we're using to convert into energy. We must learn how to harvest this resource. It's quite probable this would be or already is a good NRLA opportunity for some of the ancillary equipment.

This brings us up to the prototypical example of solar energy. That is your solar collectors mounted typically on the roof and collecting heat to heat the water. As I mentioned, the northeast solar energy center this past February launched what we termed "Operation Sun Power" to get that industry off the ground. The net effect has been increasing sales by several times, and the total number of installations just in the last eight months has doubled.

A year ago at this time the whole industry was going to go out of business, and part of it was they were having problems.

There are some serious numbers about solar water heating. Mainly because of the inflation factor, solar is a hedge, it's an insurance policy against escalating costs. You pay one time for solar, then you start saving money each and every year for a string of years, and the natural life would be 20 years. We have done some calculations. If you look at a 15-year savings, we'll say 90 cents a gallon for home heating oil, you're saving over $8,000. That is given a good buy. Although a hot water system will cost $3,000 now, the National Energy Act contains tax credits, and many of the states have state tax credits which will reduce the cost. With the National Energy tax credits that $3,000 comes down to about eighteen or nineteen hundred dollars. Then if you have a state tax credit, and last month here in Massachusetts the law was passed that includes a 35 percent tax credit which would bring the net cost down to about $1,200. We are finding new mechanisms, new creative structures for financing, and this business is off and running.

The last solar technology which is, in fact, perhaps most relevant to this group is passive solar design. It's a tough concept for a lot of people to understand. But passive solar is where you just use the natural laws of science. You orient the house correctly towards the south. You use multiple glazing. You use an overhang on the south for the summer, and you provide as much possible thermal mass. Now passive solar wasn't talked much about two years

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ago, three years ago, but in the last year it's really picked up.

Let me just explain one concept here. What this shows is the orientation of a window, north, south, east, west, as a function of single glazing, double glazing or double glazing with night installation. The net message here is that south is a winner all the way. With double glazing you save about six gallons per window per year, and with double glazing and insulation about eleven. North is a loser under both cases, and single glazing is a loser in all directions. So those are three very important points and indicate what passive is all about. All we have done is orient the window, whether it be a single-glaze or double-glaze window. Just by doing that you can understand how a given structure can either gain or lose energy over the course of a year.

At NESC we have been involved in understanding what the possibilities are for passive and particularly retrofit because here in the northeast retrofit is going to be where we do a lot of energy displacement. One thing we learned is that we should start selling solar energy in its many forms and its many technologies as you would sell anything else. Said differently, we want to sell the state because we think we have a state to sell. It's a good value, but we also want to sell the system. So we brought Better Homes & Gardens in.

The punch line here is that the northeast solar energy center is in favor of solar energy, which I think you might have anticipated. Solar's time has come. It's non-radioactive. It's non-polluting. In fact, it's renewable. The Arabs understand solar's benefits quite well. Saudi Arabia is spending its OPEC dollars on a massive solar program. They know that they're going to run out of oil, and they're certainly worried about their grandchildren. Plus solar is aesthetically pleasing. In a time of recession with high and escalating interest rates and slow housing starts solar can help sell homes which is important. Beyond that solar can add to the quality of life. A good, selfish reason for saving energy.

Aside from the obvious, what does this mean for lumber yards and builders? It means business opportunities. By spring businesses and homeowners still smarting from the unprecedented prices they've had to pay for oil will be searching for methods to reduce those heating costs for future winters. They will be looking to you for advice, for materials and construction skills, for retrofit as well as for new construction. Not only will you be asked to supply and install energy conservation materials such as insulation, weather stripping and insulated windows, but you will be asked to supply the materials and expertise required particularly for passive solar heating, the basics of which are quite simple: maximum use of south-facing glass, minimum use of north-facing glass, use of better and more insulation and use of dense building materials for heat storage. Passive solar heating means increased demands for home additions, which can help collect solar energy for home heating and at the same time provide additional living space, particularly in the kitchen areas. Some owners will use their new sun spaces as a comfortable workshop or family room, while others will be interested in enjoying benefits of solar greenhouses. In some cases solar collection can be improved by simply replacing obsolete windows or moving windows to the south side of the house. Additionally, homeowners can save energy by installing movable insulation to cover windows at night. The spring will bring new opportunities for lumber yards to market their products and services, if they can offer energy-efficient additions and possibly passive solar homes that provide lower heating costs.

If you are interested in learning how to prepare to take advantage of these opportunities, please, speak to one of our staff members.

In sum, the energy crisis is changing quite fast. Such change can be viewed either as a threat or as an opportunity. NRLA members can be good guys or they can be bad guys, progressive businessmen or laggers. To participate and to contribute NRLA members must be informed. From our vantage point NESC is here to help. We have the biggest solar library in the northeast. We have 50 professionals right down the street, and they fan out all over the region. We have a field office in Philadelphia, one in Brattleboro, Vermont. We're here to help free of charge.

We have an outline of a short seminar that is called "Turning Windows Into Profits," a little brochure, an explanation of what a passive solar home is, a brochure on solar greenhouses because we believe in advocacy. We also have a bumper sticker.

In closing, since all of you seem to be truly good guys, which means you will be seeking us out, I look forward to working with you. Thank you.

THE MODERATOR: Thank you, Joe.

Our next speaker will be Charles B. Hartmann, Division Manager, Residential Insulation Distribution, Owens-Corning Fiberglas Corporation, Toledo, Ohio.

CHARLES B. HARTMANN: Thank you, Dick.

As Joe introduced his talk, the 1980's are obviously going to be a different decade than the one we have recently been through. We think two of the major issues that we're going to be confronted with in the 1980's are inflation and energy. Obviously, the topic of our conversation today is "Energy and the Lumber Dealer." That is what I am going to speak to as it relates to insulation.

In the 1970's we at Owens-Corning thought we had done a fairly good job relative to advertising insulation, telling the consumer, builder, et cetera, what to do in insulating their attic, side walls, or basement. We were fairly proud of ourselves and felt that the name Owens-Corning and the color pink had become somewhat of a household word. By the same token, the fact is people began to buy insulation because of the cost of energy.

This particular graph, to my way

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of thinking is extremely concerning. This is a Data Resources market research analysis as it relates to the Consumer Energy Index running from 1970 to 1990. It says the average monthly heating cost in 1970 was $50 a month to heat your home. In 1990, if we as a country, and you as an individual do nothing, your average cost is going to go to $368 a month. I am not terribly good at mathematics, but if you multiply that by 12 that has to be somewhere in the magnitude of $4,000 cost in energy to heat your home. In all candor, that is why we're here: to discuss ways and methods so that we are not going to be confronted with that type of situation in the 1990's nor are your children or grandchildren going to be confronted with that type of situation in the decades of the 1990's and beyond.

As we look at the insulation opportunities and energy conservation opportunities in 1980, we see two areas in which insulation is used. One is the new residential market and the other is reinsulation market. Let's take a look at 1980 relative to the market opportunities compared to previous years.

Economists say 1980 housing starts are going to be down substantially from 1979 and considerably lower than 1978. The seasonality of conventional housing starts, as you look at 1979 and 1980, give a fairly good feel for what they are saying relative to when all of this activity is going to happen.

I don't think there is much question in many of our minds that the new residential construction activity for 1980 is, in fact, going to be less than it was in 1979 and, therefore, probably affords you, the lumber dealer, less of an opportunity to sell your goods to that marketplace.

We do, however, look for a substantial increase in the reinsulation market opportunity.

Reinsulation, as we identify it, is attic reinsulation, only attic reinsulation, not including remodeling, not including any other types of insulation application. So as we see the opportunity in 1980, it's in a reinsulation marketplace. In essence, what we're saying is it appears housing starts are going to be down. The reinsulation opportunity we feel is going to be up, and the simple reason for that is fuel costs are up and, obviously, are going to continue to be up.

This reinsulation activity slide shows the activity by quarter. As you can see, it's considerably greater in the third and fourth quarters of the year, which obviously are the quarters when people begin to think about forthcoming fuel costs, particularly in the New England area where heat is the prime cost as opposed to air conditioning. The reinsulation opportunity in 1980 will be up from 1979 but the activity is probably going to be very similar as it relates to the quarterly utilization.

We're getting a lot of help these days in promoting insulation from our good friends in Washington as well as from local politicians, so on and so forth. There are a variety of energy conservation proposals that most of you should be aware of because they can have a great deal of effect on your business. They are rather complex and you have to decide whether or not they are advantageous to you as a businessman and to you as a United States citizen, but those are just six of the proposed bills that are sitting today in front of Congress. Obviously, we're going to have many more as we get into the election year of 1980. As an industry, it's very important that we be aware of these.

We have gone through a situation in the insulation industry in the past five months as well as through 1977 and 1978 where insulation supply was not adequate to meet the demand. That is a difficult situation from the standpoint of consumers, it's a difficult situation from your standpoint, and it's a difficult situation from our standpoint. We feel it is our job at Owens-Corning to continue to promote the proper use of insulation and we will continue that effort, to sell your customer the need to insulate. Reinsulation is a major way to conserve energy. So we are going to continue to aggressively promote the use of insulation in 1980, and we are going to begin this rather rapidly. I'd like to give you a quick view of what we're going to do, so you have a little bit of feel for it.

In the Winter Olympics which begin in Lake Placid on February 13th, 1980 we are going to come back on national television, and we're going to communicate to your customers, the do-it-yourselfer, to go down to his lumber dealer today and buy insulation because he can save twice. He can save once because insulation presently is on sale at participating lumber dealers, and he can save secondarily because as he adds insulation he reduces his fuel usage.

We have used this type of approach on a regional basis in the past and have found it to be quite successful. That is why we're going on network television with it. Basically, it affords you an opportunity to do two things. No. 1, increase your sales and, No. 2, make the consumer aware of the fact that insulation is the most cost effective way to conserve energy. So even though we have been through some trying times in parts of 1979 and 1978, I think it's our responsibility to communicate to you and properly promote and advertise the insulation product for use at the do-it-yourself level as well as the new construction level.

There is one other thing that I would like you to take a look at. We are introducing a Fiberglas insulating sheathing product on February 1st, 1980. It's a Fiberglas sheathing for new construction. It is designed to replace blackboard, plywood and other sheathing products.

That is how we see the market for 1980. From an insulation standpoint, it's a very good opportunity for the lumber dealer. We're going to spend a lot of time, effort and money in promoting Owens-Corning pink insulation primarily to the do-it-yourselfer, but also to the building market. Thank you.

THE MODERATOR: Thank you, Chuck.

Our next speaker, John Ed Ryan, is District Manager of the National Forest Association from Hoboken, New Jersey.

JOHN ED RYAN: The National Forest Products Association is a

federation of 29 other associations as well as other individual concerns representing over 2,500 companies engaged in the wood product manufacturing and distribution in the United States and Canada. Our main office, of course, is in Washington, D.C. My division is a technical division. Our main purpose is to provide technical data, programs and services for the industry and for other people.

Last Tuesday we welcomed in the new year and said goodbye to the old year.

Ten years ago when we welcomed the 1970's, energy was something we didn't have to play that second 18 holes of golf. Now energy has taken on new dimensions.

In any case, we have got a problem. And the idea of energy conservation is here to stay. It has gained acceptance by the public and the federal bureaucracy and the state governments, and the public has demanded or, at least, we have been led to believe they have, that energy conservation laws be enacted. Of course, the agencies have all responded with vigor. You're all familiar with this little item, temperature limits, you now have to turn down your heat.

Immediately after the oil embargo of 1973 and the formation of OPEC, the National Bureau of Standards initiated a program to develop regulations for energy. This was very soon turned over to the American Society of Heating, Refrigerating and Air Conditioning engineers, better known as ASHRAE. Their first draft was issued in January of 1975, and in August they adopted the 90-75 standard for energy conservation. This document was not written in legal language. The Model Building Code agencies responded by issuing building, electrical and plumbing regulations. In December of 1977 all the Building Code agencies got together with the National Conference of States for Codes and Standards and developed the new Code for Energy Conservation in New Building Construction. This code has now been adopted by most of the model building code agencies or they're changing their codes to comply with this code. It is the basis for Massachusetts, Rhode Island and Connecticut Energy Regulations. At the same time the Federal Government adopted the Energy Policy Conservation Act of 1975 which required the states to develop and implement a plan to effect a five percent reduction in energy consumption by 1980, including mandatory thermal and lighting efficiency standards. Subsequently the Energy Conservation Production Act of 1976 directed the Department of Housing and Urban Development to establish thermal performance standards for buildings.

The National Forest Products Association has been vitally interested in this activity, and in cooperation with your National Association and other associations and companies we have strived to assure that any of these regulations that were adopted were fair, that they were justified and that they were unbiased.

As far as materials are concerned, on a local level, our concern has been that these consensus standards which are promulgated by ASHRAE and the model codes be incorporated without major changes in the local and state codes. Very happily, the state agencies also recognize the need for uniformity, and they have and are adopting national standards.

HUD has recently published standards mandated by Public Law No. 706, and copies are available. I will tell you how to get to it in a directory I have for you later, if you're interested. The comments are due by the end of January, but there may be additional time. It has been said that they are too tight, and I have heard comments that they may not be tight enough. I think it's all relative to how much you want to spend. It's like the man who ran home behind the bus and told his wife he saved two dollars. His wife said, "Why didn't you run home behind a taxi and save six dollars?" It's relative.

The only thing about the HUD standards is they will not have any clout unless they're adopted locally or unless sanctions are imposed against the financial institutions and the government. At this time these sanctions have not been proposed and may not be for some time. In the meantime HUD, the Veterans Administration and the Farm Home Administration have adopted interim standards into their minimum property standards. These you should also be familiar with.

Very briefly, in the New York and New England states the legislation is as follows. In New York State the legislation was very specific in that the code that was adopted would have to comply with the ASHRAE or be in line with ASHRAE principals. The New York Energy office has not only published the code, they have also published some very in-

teresting documents for distribution in the state. They have initiated a training program for all the building officials and others. This training document is also available. Another one for energy saving dollars in small commercial buildings, big buildings and also a lighting guide. The lighting efficiency standards are also part of all of these codes.

Massachusetts has likewise developed a code and some documents which are available from the State Building Code Commission Office. They have one on solar heat, also in Rhode Island and Connecticut all the building officials have been through a training program to acquaint them with and also show them the proper interpretation of these mandatory state codes. In New Hampshire the code was adopted in 1979 and may be at this time the most lenient. It requires R-11 in the walls and R-16 in the ceilings. Maine at this time only has mandatory requirements for publicly owned buildings such as schools and other buildings administered by the Department of Public Improvement. There is a permissive code that could be adopted by the local communities, and probably in 1980 there will be a push to have a mandatory code in Maine. Vermont has at this time no mandatory requirements for energy, but it's understood that there will be some legislation proposed again during the 1980's.

I have prepared a directory of energy information sources plus the energy offices of all the states. You can pick one up after the meeting. I think there might be enough for everybody in the audience. I have also analyzed the various codes for the "A" and "R" factors that are required. Generally, they are all in agreement. For opaque walls the "A" factor is .08. Glazing is somewhere in the neighborhood of 0.65. If you have an overhang, that is also considered part of the wall. The doors are 0.40 to 0.65 roof ceilings 0.05 except when you have a plank-and-beam type ceiling and then it's .08 again. Floors over uninsulated crawl spaces is .08. Foundation walls is .17 if you have the ceiling over the crawl space insulated. Otherwise it has to be .08 above grade. The slab-on-grade, requires an "R" factor of 7.75 and if unheated an "R" of 5.5. All of this, of course, ties into the degree days. There will be some changes in some areas. As you read the code, if you're in a high degree day area, say, a 7,000 degree day area, it will be a little different than if you're in a 5,000 degree day area.

There is an awful lot of information available other than the codes. One of the documents that you definitely should have is the selection procedures for wood wall systems that meet Farmers' Home Administration 1978 Thermal Performance Standards. This document was developed by the National Forest Products Association in cooperation with your National Association. When the Farmers' Home Administration came out with their regulations they were very, very tight. Common types of construction, that is wood frame that we were used to in building, looked like they were out the window, if you were building under the FaHA program. However, by looking at the whole program and everything that is set forth in this document we find that we can still go with conventional construction. You do not have to start going with all two-by-six studs, R-16 insulation in walls and/or foam type insulation. So this is one document you definitely should have.

The U.S. Forest Products publication "Energy Efficiency in Light Frame Wood Construction" has some very good charts and ways of doing things. One from Canada, is called "Conservation of Energy in Housing" put out by the Canadian Governmental Housing Corporation. The addresses of these people are in this directory. The Federal Office of Consumer Affairs has a couple of good documents. Then, of course, you can get information on wood windows from the National Woodwork Manufacturers Association. All of the insulation manufacturers and their associations have literature on how to interpret the codes. You can, if you're interested, even get a table on U Values of masonry construction. However, as far as the Portland Cement Association document is concerned, they make an awful big claim that "mass" has a big effect on energy. NFPA sponsored research at the University of Pittsburgh, and the mass effect is not as much as PCA claims. It does have some impact. If you want a copy of that document, it is available. We believe that there is no basis at this time to justify reducing the U Values for wood frame construction and increasing the U Values for masonry construction as proposed by the concrete industry. There is just no technical data to justify that.

Solar energy, as you have heard, is definitely here. Connecticut, incidentally, has an exemption from property taxes for certain installations. You have to get the approval of the building official in document form to get this tax exemption. You should definitely realize that all of the state codes are for new construction. The only way that existing buildings are going to be made more energy efficient is on a voluntary basis. It is recommended that thermology could be used as one way of looking at an existing house to see where most of your energy is being wasted. These slides will give you an idea how important use of infra-red film can be.

I would now like just to briefly run through a checklist developed to show what do you do to do with an existing building. The first thing on top of the list is to check the heating and cooling units. Oversized, badly maintained units will waste energy more than they use. Two, install night and day thermometers. Three, caulk around all openings in the exterior envelope. You can lose a lot of heat by infiltration. Then, fourth, the insulating the attic, and make sure it's properly put in. Attic insulation in the rafters when you have a vented attic doesn't do very much good. It should be in the ceiling. Make sure the attic is ventilated. If you don't ventilate the attic, you might as well forget about putting the insulation in ceilings. Not only after two years will the insulation not be good because it will be soaking wet, and the wood and everything else up there is going to

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start rotting. You have got to ventilate those attics, if you're going to do a job in insulation and do it right. Don't cover up eave vents!

Next, fifth, of course, is to put in storm doors and storm windows or upgrade the existing windows. Sixth, insulate the basement walls and/or the crawl spaces. Crawl spaces must be vented. If they are not vented, two years from now that insulation is going to be wet, and it will transfer the heat faster than if you didn't have the insulation. You have got to ventilate crawl spaces as well as attics. Of course, the problem is moisture in the house. There is nothing wrong with having fans in both the kitchen and the bathroom. After a shower you turn on the fan in the bathroom and get rid of all the water that could go into that attic and to other parts of the house. By having a fan on for a couple of minutes in the kitchen, you're not going to waste much heat. These definitely should be done as one of the energy savers.

Drapes on windows. Close the drapes in the winter at night. There is a lot of radiation out of windows and therefore the loss of a lot of heat. Drapes on the windows will save energy. Venting the attic with vent fans or with attic fans during the summer, can cool down the house and save energy used for air conditioning. There are a lot of other ways you can save energy. Fireplace dampers definitely should be checked to assure that they are closed tight. You might even consider using glass doors on the fireplace to prohibit heat from going up the chimney.

Last on my list is insulating walls of an existing building. When everything else is done, and you want to go further, insulate the walls. Also, plant trees around the house. There is a lot of good instructions available on how to best do this. Trees act as shade in the summertime and wind buffers in the winter.

Then you can go to the alternate types of heating, such as wood stoves. When you do, make sure they are installed and vented properly. If you're putting them in a fireplace, take the damper out, put a piece of metal in to replace the damper and run the chimney or flue of the stove above the fireplace shelf. Otherwise, you're going to waste more heat than you're going to make. Then, of course, there's a lot of differences in the type of wood you burn. Hardwood, of course, has a very high fuel content. The soft woods don't have that much. Wood stoves are potentially dangerous. They must be properly installed—at least 42 inches away from any walls.

That is the end of my presentation. I will be happy to answer any questions you might have.

THE MODERATOR: Thank you, John.

Anchoring our panel this morning is Bruce Brownell, a 1964 graduate of New York State College of Forestry in Wood Products Engineering. He founded Adirondack Alternate Energy which is associated with Brownell Lumber Company. His company is involved in the design, engineering and manufacture of passive solar home packages with over 100 existing in the northeast. Bruce Brownell.

Bruce Brownell: Good morning. I think I would like to start out by saying thanks to this Association for becoming involved in the energy issues as they are so important and will be, I think, the most important thing to affect your business in the 1980's. There are lots of ways you can look at it. Things can be seen as being gloomy, or they can be seen as being rather bright. Those of us in the solar community see it as being a very bright decade ahead.

One of the good opportunities that confronts you is the opportunity to sell things that relate to solar and more specifically passive solar because you guys already have in stock at your yard all of the necessary parts and pieces to construct a really proper passive solar home. That will represent a really viable market for you in the decade ahead. The problem you have is that you don't really understand very much about a passive solar homes or how to put those parts and pieces together to make one. So there is a long educational road ahead that hopefully will open your eyes a little bit. You need to know how one integrates proper materials together in such a way that you end up with a passive solar structure. It's relatively easy to understand, but there are a lot of details involved, and it requires that you or somebody at your yard initially spend a lot of time learning the proper techniques.

As was mentioned earlier by Joe, there are a series of passive solar seminars that we will be giving throughout the northeastern region. They start over in New York State this winter, and later will go to Connecticut, New Jersey, and throughout the Northeast. You can inquire at the Northeast Solar Energy Center in Cambridge, Massachusetts about the seminars and dates for your area. Personally I hope we will see a series of educational efforts directed at the guy at the lumber counter.

Let's start with the slides. Do you know what is the basic problem? The basic problem is we have a crisis, an energy crisis countrywide and worldwide. It's not going to go away. The real basic problem, if you come down to it conceptually, is "where do we save the most Btu's for the dollars expended." I think sometimes we lose sight of that. During the next months and years, when the salesman comes through with that new whatever product, sit down and ask yourself that question: Is this in a realm of saving the most Btu's for the least dollars expended? That is the cold, hard test. It's sometimes very hard to come up with those answers, but that is the test that some of these things will have to pass, and it will ultimately determine success or failure of whatever it is somebody proposes to do to save energy.

The properly executed passive solar building is one of the very best investments one can make because you save money from the day you decide to do it and every day thereafter in ever increasing amounts. What do we have to do to create the proper passive solar structure? There are three basics, and I will repeat these so we can all keep them in mind. The

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first thing you do, again with this idea in mind of how do you save the most Btu's for the least dollars expended, you look at the problem of heat loss and find that the answer is conservation. We are fantastic energy wasters. Everywhere I look I see us throwing away energy like there is no tomorrow. We have to conserve. Most of the time conserving is the increased use of insulation. You have to go a long, long, long, long way down the insulation road before anything else begins to make any sense.

The No. 1 thing to do is insulate. The level of insulation that we accept to create a properly insulated house in 1980 is nowhere near enough. I understand that you are lumber dealers and that dealers are cringing at the onset of new insulation codes, but they are only the beginning, and they are nowhere near stringent enough. For instance, the requirements of the New York State Energy Code, and I commend them for this, require an R Value of a wall of 5.2 if the wall does not contain doors or windows. That is not enough. I suggest you can achieve that R value by installing foil faced sheetrock on a standard stud wall with no insulation in the cavity. The door requirement is 2.5. I have nothing against wooden doors. I am a wood products engineer. I like wood more than you guys do, but the doors really should require an R Value in excess of 10. So we need to look at some of these things, call a spade a spade. It might better be sooner than later.

Anyway, the first thing you do for the proper passive solar structure is to insulate. The second thing you do is simply begin to relate to the only free energy source you have available to you: the sun. It's a nuclear furnace 92 million miles away with no waste to take care of. They can't turn it off or tax it. So we have to relate to the sun.

How do you find where south is? Go out to the proposed place where you intend to build, stand there and look at your shadow at noon. If you use a compass, you will mess it up by 15 or 20 degrees. Look at your shadow, it's pointing due North. Remember that in the summer we're on daylight saving time and you would do this at 1 o'clock. Anyway, once you've found out or determined where south is, orient the long wall of that structure at right angles to south such that that wall receives the maximum amount of insolation. Insolation is a measurement of sunlight. One should upon retrofitting — that is the term that you will hear an awful lot more of—retrofitting an existing structure to passive solar remove a good bit of the glass on the non-sunny side. You saw the slides showing the effect of glass on the north side of the house versus the south side. North glass is a loser all the time. South glass, if insulated, two panes not three, becomes a gainer. It's a very positive effect. So in retrofitting we would eliminate wherever possible north glass and add within reason south glass. You can overdo it also, so be careful giving out advice without some proper education relative to this principle. This then is our second basic. Increased glass area on the south side of the house and decreased glass area on the North.

If you take the conventional house, as you're doing it, and you get much beyond 20 or 25 percent glass on the south wall, you will run into a tremendous overheating problem. It becomes very unpleasant during the day in a glassed-in solar room, and it can also become quite unpleasant at night. There are many things that need to be retrofitted into the design to have it work properly. If it is not done right, you can run right smack into a problem.

A lot of the passive solar houses we're working with have R-40 envelopes. To insulate a house that well means it's insulated some ten times better than what you understand to be a well-insulated house. If you do that and then begin to place a lot of glass on the south side, on a sunny day that space will overheat. During the six or eight hours of a day that the sun is out, that space will just get so hot that you can't stand it in there. I've built some houses like this when I was in my learning phase back in the 1960's. You need to do something additional, obviously, to prevent that from happening. Just opening the doors and windows and throwing the energy away doesn't make sense.

The sun is a well-insulated structure that has an insulation R Value of 30 or above becomes very much like the wood stove that you're already familiar with. The wood stove is a point source of heat. If you're cold, you fire that up, and some 20 minutes later the room becomes so warm that you have to open the windows or the doors, and when you do that you're throwing a good bit of the Btu's away. The sun is a well-insulated structure can have the very same input. Boy, by noon or one o'clock on a sunny day you have just so much energy in that space you don't know what to do with it, so you have to begin to store it.

As our third principle, we would use mass storage to collect some of this energy and store it for use at a later time. You do not have to throw it away. Mass storage comes in many forms. With the proper performance insulation envelope, one of the very effective mass storage forms is the sheetrock you guys sell. The problem is, if you don't have the proper insulation envelope, which is generally the case, the sheetrock really becomes a detriment. It's on the wall. It's next to the cold surface. It wicks the energy out of the building. With proper insulation sheetrock can become mass storage, also the concrete in the floors, or a massive central masonry adjacent to a chimney for the wood stove. We put in mass storage chimneys that have an average of 20 tons of thermal storage capability. Again, it's very heavy and can store heat energy. Insulate the outside of cellar walls. Again, they can store this excess energy.

I don't want you to become confused with the statements from the previous speaker. I don't disagree with what he had to say about mass storage. I am saying the energy I am talking about storing is free energy from the sun. There is a difference. To a degree you can't afford to insulate mass, so that heavy masonry or whatever will store the energy if you are paying for it. It doesn't make any sense to heat this heavy mass

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building with fossil fuels. If you insulate the outside of it, you have to heat all that mass also. You might better insulate the inside and only pay to heat a small light mass inside. But if the energy that you have is free, then one can afford to insulate mass and store it. If you don't store it, of course, you throw it away. So it is very important to insulate the mass storage. And mass storage can become any number of things. You can place gallon jugs of water if you want to all over the sun space. That is very inexpensive mass storage.

So we have three basics that are necessary for a proper passive structure, insulation, South glass, and mass storage. When you properly insulate you need to control humidity. This is an important issue and something you really need to become involved in so that you understand it. If you're into the Fiberglas-cellulose bit, you have to do a lot of ventilating. Generally, the methods that are currently used aren't proper in that regard yet. If you do use some of these, some of them don't perform very well. You can get condensation on the inner surfaces on the insulation, if you're working with some of the lower R Values. If you use a low R foam envelope and it's zero or even 10 outside, you can also get into a lot of trouble. A great deal of education is needed on humidity in tightly insulated structures.

South glass. Two panes of glass only on the south side. Get the guy, at the counter to understand that at least. Use three panes on the north side, two panes east and west, assuming that you have access to the sun on the east, south and west surfaces. If you're on the north side of a mountain, you better put triple panes everywhere.

Briefly, what do I do in my houses? I'm going to show you in the end some slides of actual houses to give this whole scene some credibility. I envelope the house, and I use a polyisocyanurate sheeting which is available in the marketplace, faced with foil on both sides. I typically would use two inch boards of this material in four-by-eight sheets, and I envelope the whole house in two two-inch layers on all 6 sides. My house then gets insulated to a factor about ten times better than the houses you're familiar with. That means that the energy needs of the structures are one-tenth the energy needs of the structures that you're familiar with. I generally need a source of heat in a house that can provide 10 or 12 thousand Btu's. I once tried to buy a furnace like that, but they just aren't available. Since I have been insulating houses to a higher factor, I have installed electric heat. I need three or four thousand watts of electric heat which is double the amount the house really needs, but it more quickly brings up the temperature. My houses typically need 1500 watts of electric heat, or wood stove fire once in a while instead of the electric heat, depending on how you want to do it. The importance is in the insulation envelope of the house, that is up the sides, over the roof and underneath. This continual foam insulation envelope is of a very high performance R-30 or above, typically R-40.

The next thing that I do is to place a lot of glass on the south side of the house and a minimal amount of glass on the north. In the north side, you need to have some glass, usually a bathroom window, kitchen window, something to provide visual control so you can see what is going on out there, where the kids are, etc., but we try to keep it down to 10, 15, no more than 20 square feet. Be careful with too much glass on the south side, once you have insulated to an order that I have, and again there will be some misunderstandings, if you aren't careful. My houses are insulated better than the industry will do or better than most people will do. With an insulation envelope like I have, I only need to have about 30 percent or 35 percent of the south side of the house glass because that amount of glass will provide all of the energy I need in my houses to achieve the performance level that I'm after.

Lastly is storage, mass storage. Again, I took a look at the cost because I am building for everyday, ordinary people. I live in the Adirondack Mountains in New York State. We have a high unemployment rate. I think we have maybe two rich people in the whole 120-mile area called the Adirondack Park, so I build for ordinary, everyday people. I have had to take a hard look at costs. I use for mass storage the cheapest and heaviest material usually around there. In our area it happens to be sand. So what I do is below the lowest floor of the house, wherever that is, I install sand. I install a lot of sand, usually four feet under the house, but inside of the insulation envelope. This becomes 150 to 200 tons of mass storage. In the sand we put pipes or ducts through which we can blow air, and the only mechanical system in our passive solar houses is a fan. The fan takes air from the highest place in the house, sucks it down and blows it through the pipes in the sand, and then it goes back up into the house again. So this mass storage becomes a flywheel, a thermal flywheel. It just keeps the house going along at whatever the temperature the house is at. It's very hard to change the temperature in a house with 150 tons of sand, insulated at R-40. It's very hard to change the temperature in the storage very much in a 24-hour period. You can change it about two degrees, if you try very hard, but it just sails along fine.

That house will receive through 200 square feet of glass on a sunny day in February when it's 20 below zero 60,000 Btu's per hour free. That is 360,000 Btu's a day. What are you going to do with 360,000 Btu's, if your well-insulated structure needs only 60,000 a day? What do you do with the extra 300,000? That is like 300,000 candles burning for one hour, which is a lot of energy. You'll throw it away, if you don't know what you're doing, but if you have enough mass storage, if you have 150 tons of concrete and sand, the house will have the capacity of storing up 100,000 Btu's per degree change of itself. That is, we can put 100,000 Btu's in this mass, and we're only going to increase the temperature one degree. So we can store energy in this mass and increase the temperature of our mass two or three degrees. We charge it up. I tend to call my mass

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storage a "heat energy battery." When the sun comes up in the morning on a sunny day, it charges the storage and warms the house gradually. When the sun goes down, the storage will discharge and continue to heat your house. If you ultimately get too cool at the end of two non-sunny days you have some other choices. You can turn on your electric heat or leave it set so that it comes on automatically. Or, in lieu of that, you can have a wood stove fire.

A wood stove in a well-insulated structure is an important source of heat and can easily drive you out of the house. We eliminate this problem. Essentially, as you start the wood fire, the fans take air through the house, past the wood stove and into the heat energy battery. The wood stove, like the sun, simply charges your heat energy battery. In place of the sun's energy at the end of three cloudy days, you have a wood fire, and you charge your battery up for the next few days. So our claim for most of our houses that we have—again, I would remind you in an 8,000 degree day climate, which is 15 or 20 percent colder than Boston, 20 percent colder than Albany, New York, houses which are 2,000 square feet would have a need for about $120.00 of electric heat for the entire winter. That is figuring it at four cents a kilowatt hour. Or, in lieu of using electric heat, if you choose to burn wood. Buy a cord of wood delivered and piled for $30, you would need two pick-up truck loads of wood for the winter, at a cost of $60. The first time you would have a fire, generally speaking again, is about the first week in December, and you would tend to have two or three small (4 hour) wood fires a week in this house. The last time you might burn wood would be the first week in March. This is not pie in the sky. We have a lot of houses operating like this. They work just fine.

These house pictures are all passive solar houses. They do not have furnaces in them. They have been financed by a bank in some small community. In some places that is easier said than done. People live in them, ordinary, everyday people.

The first couple of slides that you are seeing are some interior shots showing the sunshine. It's pretty nice to be in the warm embrace of the sun from morning to night. That typically happens in the passive solar home. This is a six-foot sliding glass door letting some sun into a dining room. A lot of houses are post and beam which are done by the owners. This slide shows something that is not too proper. This house has too much glazing on the south side of the house. This particular client had a beautiful view, wanted to have a panorama. Therefore, we put glass all the way across the front of the house. It's not proper in most cases because that space will tend to overheat on a sunny day. That space will also tend to get very cool on a cool night. At 40 degrees it would be very cool standing in that house. You have to get some sort of insulated shading.

I would caution you on shading right now. Shading has its problems. There are a lot of new developments yet to come. One of the big problems is that to be effective the device, that curtain or shutter must be put up on the window all of the nights and many days all winter long. I don't think you people are going to do that for 150 continuous nights. That is the single biggest problem right now.

More traditional (shown here), three double-hung windows nevertheless offering a lot of solar input into that space, enough to power that particular space as a passive solar space. The more traditional home, sheetrock, studs, fireplace. Fireplaces are awful things. I try to tell people they don't want them. I try my best to talk them out of it. They're energy losers.

Another space, a lot of sunshine. Again, glass looking out on the lake. This is another big problem. You have conflicts with view and the sun. Of course, a number of people, especially in the country, usually choose their site because of the view, because of what they see. That is one of the reasons they choose their land. You might get a client on the south side of the lake looking northward. It is very tough to do a proper passive solar home orientated like this. We have done that, but it's a very tough problem to solve. So with new structures, you get people to think, if they're interested in using solar, about the couple of acres they buy before they buy it. It is essential that you have access to the sun.

Here's a shot of some of our houses in the envelope stage. That is, they have been enveloped with two two-inch layers of a polyisocyanurate that is skined with foil. The foil provides as well as does

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the polyisocyanurate a total barrier to the passage of humidity. If you look carefully, you will see the joints are staggered, and that the envelope is total. The only thing punching holes in the envelope on the home would be the windows, the doors, the rafter tails, the plumbing vents, the incoming water and electricity. Other than that, the envelope is a total envelope.

We don't have houses that are too tight. One of the first questions that comes up is humidity problems or smell problems. More than ample ventilation will come from the occupancy. Simply by opening and closing the doors there is more than enough air change. We specifically don't use air locks for this reason. When you get a house as tight as this, you need air changes, and that is provided by door openings, window openings and exhaust fans.

Lastly, I wanted to end with this shot. This is a spaceship that we all inhabit. I suggest that, if we don't begin to use the sun during the 1980's and use it in large measure we're going to be in a lot of trouble. I would hope that this presentation is the beginning for you, that it opens your eyes a little bit, that you realize that those houses you just saw exist here in the northeast. One of them could be down the road from you. You could have sold the materials for it. I suggest you might have a lot more luck selling a proper passive solar house like these in the spring of 1980 than you will one with an oil burner. Thank you.

THE MODERATOR: Thank you, Bruce.

I would like to give the audience an opportunity to ask a question or two. If you would, please, address the questions to me and tell me which members of the panel you would like to answer it. May we have some questions? Anybody?

FROM THE FLOOR: Mr. Brownell, is there any problem with keeping the siding on those houses when you use the sheeting like that?

MR. BROWNELL: The question is: Is there any problem keeping the siding on those houses? No. There is not. It requires an understanding of a lot of detailed work. We developed our system over 17 years and some 3,000 mistakes. I just caution you. Do not go out and do these things until you become educated. We are very open at our place. I hope there will be a lot of education programs to train you in how to do this. It can be done and can be done quite simply. Don't go out like a couple of guys I saw up in Lake Placid where they build a home that had four inches of foam and the siding nailed through to it, and it all sagged about two and a half inches two weeks after they put it on.

FROM THE FLOOR: A question on triple glazing. The north side of the house, they recommend the triple glazing, but on the souther exposure they said just two panes of glass are standard. Why? Joe or Bruce.

MR. LEVANGIE: I think the logical reason is that you don't need that much energy coming in the south side. In other words, it's the same trade-off as with putting too much glazing on the south side. You have to worry about the summertime when it overheats.

MR. BROWNELL: Also, it turns out that there is a balance. Each layer of glaze costs you incoming solar energy. As you go to more and more layers, there is more reflectance and not as much solar energy comes in. On the other hand, each layer of glazing insulates you. As you have more layers, less and less energy goes out at night. But, if you investigate this technically, the balance point from the thing you ought to use is double glazing, the usual insulating glass we have all been selling. The point I make, at least, go away from this meeting with a message that should instruct all your people not to let people put triple glazing on the sunny sides of the house. That is one thing you should understand.

THE MODERATOR: One more question.

FROM THE FLOOR: It occurred to me as I was listening particularly to Joseph's statements that, perhaps, our Association should take some stand in regard to government policy on conservation. I see a conflict, especially in the references to Schlesinger, between the emphasis that has been stated here on conservation with government support versus government support of coal or nuclear power or gasification or the various other things. I think as lumber dealers we are in a position to take advantage of government subsidies for conservation measures, and I would hope that you will speak to the leadership of the organization and see if we can't get behind some of the bills that were shown up there. That is not a question. I'm sorry.

MR. LEVANGIE: I would like to agree with that because we of the Northeast Center are delighted to work closely with the NRLA because we have basically the same region. Let me just comment. Bruce and I were talking about Schlesinger's statement, which I don't think was a public one. It was in answer to a question. He was asked what about solar. He said, well, for homes maybe in the very long term there would be some contribution by solar, but not in the northeast. You know, that just wipes out everything that we have been trying to do. I think it shows a bias which, although our company gets paid by the Federal Government to run the Northeast Solar Energy Center, I think I can say without getting blasted that some of the leaders within the Department of Energy, particularly in the last administration under Schlesinger, had a bias against decentralized energy sources including conservation and towards centralized ones where you could apply all of the good rules of high technology. If they were running your lumber yard, they probably would determine the results of the paper study that the ideal lumber yard was about a million acres in size. It's a question of philosophy. The things we're talking about can be implemented on a decentralized basis. We would like to talk with you about that.

THE MODERATOR: Opportunities, new markets, I think you have heard about them. They all come from education. We have to get that education and get it to our staff, our employees, the consumers. They will be coming in and asking you. Let's be ready for them.

The CHAIRMAN. Thank you very much, Mr. Pierce.

Let me express my appreciation to all of the panelists. I want to particularly welcome Paul Warner from Portland, Oreg. Sorry I wasn't here to greet you when you were introduced.

Are there any questions of the panelists?

Mr. Pickle?

Mr. PICKLE. Mr. Chairman, I thank you for giving me a chance to comment. I was not able to be here for the morning session and if I had been I would have liked to have reminded the committee of the interesting trip I made to Oregon with the chairman a couple of months ago in which we personally visited some of the sites being used now for passive solar energy.

I was impressed with it. I felt a little bit guilty in a way that I had to go all the way to Oregon to get the full attention of what passive energy could mean because I have so much energy in my broad area in Texas.

They don't have a chance for the sunshine to get through those big trees up in Oregon. I saw what they were doing. It was working.

The chairman was good enough to give me the privilege to visit some of these facilities.

I am a supporter of this program. I am convinced that what we thought a year ago was just a passing fancy has very meaningful importance and significance to this country.

I recall, Mr. Chairman, 1 year ago when we had the windfall bill and held a day's hearing on passive energy, it was classified with wood burning stoves and windmills and a few other approaches.

The hearing didn't last a full morning. We just broke up in some state of humor. It is not a humorous thing. It is a serious thing. We ought to go forward on it.

I don't want to repeat what has been going on, but I would like to ask this panel a question or two.

The bill or the maiden bill that has been introduced by the chairman would allow $2,000 credit for a new residential unit.

I want to know if the homebuilders of the country now, to your knowledge, endorse this legislation? Are they behind it? Is the National Home Builders Association working with you? Have you visited with them? I have not had much response from the homebuilders in my area, and I am wondering how it is.

I heard the gentleman from the Northeast. I wondered what is the attitude on a national basis with respect to homebuilders? Can you comment on that?

Mr. PIERCE. They testified earlier, I believe, in support of it.

Mr. PICKLE. In support of it?

Mr. PIERCE. Yes, sir.

Mr. FOWLER. They were here this morning.

Mr. PICKLE. I haven't heard much support from my homebuilders. I wondered if they had taken up this effort? The gentleman from Georgia says apparently they have.

The approach is to go through a builder. I gather from your testimony that you agree with that, that that is the proper place, though some of you are in the window business. Still the credit would go to the builder. You would work with him in whatever approaches he takes. Do you think that is a proper approach?

Now, the question really is this: If we give a $2,000 credit, what does that represent in costs to the builder? In order for him to get a $2,000 credit under normal circumstances, would he in his construction, his planning, his design, spend $1,000 extra, $2,000, or $10,000 extra, in order to get that credit?

Do you have any way to relate what it would actually cost in order to put this in, to get the credit?

Another way of saying it, will the builders think this is incentive enough?

Mr. WARNER. I might respond to that. This morning the TVA gave a cost estimate of $1.56 per square foot added cost to the home. In a normal house, it would be roughly $1,500 for the added cost of going solar.

Mr. PICKLE. Who testified to that this morning?

Mr. WARNER. The Tennessee Valley Authority. They are the electrical generation people. They have done studies along this line.

Mr. PICKLE. Did the homebuilders testify this morning how much they think it would cost to make the design and installation?

Mr. SCHNEBLY. I have a fact sheet from the National Association of Home Builders. I am not authorized to speak on their behalf. Their survey indicates that about $2,000 roughly per house, at least in the initial phases of this tax credit, would be required for a builder to adjust his plans and schedules and his siting of the houses for the incorporation of the modifications.

Of course, after the builder becomes familiar with this construction principle, and after he adjusts a lot of the people he works with in siting, zoning commissions and other requirements for altering the orientations of his houses—the costs, of course, would drop down.

Their point that $2,000 per house does reflect the actual costs to motivate a builder to change his normal practices. A consultant to the National Association of Home Builders, the Ducker Research Co., pointed out that a 10-year traditional lead time is required to introduce new construction products or practices into the construction industry.

Their effort was to shorten the amount of time it would take to get a large percentage of the Nation's builders thinking in terms of passive solar design, better insulation, and better construction practices.

Mr. PICKLE. Again, I am sorry I wasn't here this morning to hear the testimony of the Home Builders Association, but in effect, if the anticipated costs are the equivalent of a credit, then what hesitance should there be on the part of builders at all to go forward? Would you not think that they would be very enthusiastic about this approach?

Mr. PIERCE. With your permission, I will call upon Bruce Brownell, a lumber dealer and builder of passive solar homes in the Adirondacks in Edinburg, N.Y. He does not represent the homebuilders.

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STATEMENT OF BRUCE BROWNELL, ON BEHALF OF THE NORTHEASTERN RETAIL LUMBERMEN'S ASSOCIATION

Mr. BROWNELL. I have built over 100 passive solar homes, and I would say that to one of my homes, in an 8,000-degree-day area—very cold there—passive solar adds about $6,000 to $8,000 to the cost of a home. This would be relative to a $75,000 or $80,000 home.

This home offers the obvious benefits of reducing the owner's energy costs per year to $100 per year. However, this incentive would go a quarter of the way, if you want to call it $2,000, of this extra cost.

Certainly it would be a big benefit.

Mr. PICKLE. Do I understand you to say that you estimated the extra cost of the average home would be around $6,000?

Mr. BROWNELL. No; I am not saying that. I am saying homes as I build them in the Adirondacks, not the average home. The way I am now doing it, it costs $6,000 to $8,000 more to reduce the energy costs of the typical home from $1,000 a year to $100 a year.

Mr. PICKLE. Would that not be typical then of other parts of the country?

Mr. BROWNELL. I think not. I have been at this for 15 or 18 years. I insulate a home to a much higher level than the average builder is now doing.

Mr. PICKLE. The work you are doing is just not passive but is a combination of insulation and location and other approaches?

Mr. BROWNELL. That is correct. Passive solar is putting it all together. You cannot do one thing. It is a combination of many things properly applied to the structure in order to get a desirable end result.

Mr. PICKLE. The more expensive the home—the $2,000 would not be that——

Mr. BROWNELL. $2,000 would go a long way toward aiding the average builder with a home as he is now building it.

Mr. PICKLE. What do you classify a home worth how much?

Mr. BROWNELL. Whatever the for sale price is across this land. It ranges on the bottom side of $100,000, $70,000, $80,000.

Mr. PICKLE. One other question. Are the definitions of a residential unit and the standards that they require both for the collector system and the absorber and the storage mass and so forth, as listed in the bill that has been introduced, are they satisfactory? Are they reasonable?

Mr. BROWNELL. I would generally agree with those five requirements, with the exception of one of them, and this is the absorber. The term absorber, I think the definition of the absorber is not quite correct in that it includes the word "hard" and the word "exposed."

The absorber does not necessarily have to be hard nor exposed.

Mr. PICKLE. Mr. Chairman, I am not going to take the committee's time. I am glad the builders in my area, Austin, Tex., are becoming active in this field. I visited one or two within the last month. I think this is going to be an approach that more and more builders will utilize.

It is a new theory, in a sense, that you give credit to a builder. I rather believe, though, it is the only way you can go about it if you take this approach. If you people who are the components of the

building industry would be able to work through your builder, I don't see why the others wouldn't. We can make it work with that approach.

I appreciate the interest. I appreciate, Mr. Chairman, again you taking the lead in this, which I think it is worthwhile. I thank the chairman.

The CHAIRMAN. I thank my friend from Texas.

We, indeed, did have good hearings in central Oregon, in Bend. There is a good deal of interest in passive solar area. It is my hope that we will be able to perfect a bill. I would like to be able to do it this year, if possible, make it effective as quickly as possible so that we can get that incentive in the system.

I think the testimony generally has been that builders without incentive are going to be very slow to move.

Mr. Pierce, evidently you have been moved more aggressively than some of your colleagues, is that right?

Mr. PIERCE. We are trying to. We have been quite involved. The lumber dealer is in a very unusual place. He is in every community in the country, and he is the place where a lot of people come for questions, whether it be on retrofit or on new construction.

You may use a builder that is not a member of ours, but nevertheless we provide a vast amount of the material both in the Northeast and other parts of the country.

We are very anxious. It is an exciting field. It is the first time we have had a charisma to put on this question of energy conservation. I think the public will go for it. I think what you are doing is in the best interests of the Government and the public.

The CHAIRMAN. I thank you. I thank all of you. It has been very excellent testimony.

Is there further questioning?

Mr. Fowler?

Mr. FOWLER. I don't want to detain you, Mr. Chairman. Thank you.

Let me say to the gentleman from Texas, my friend who is also supporting this legislation, Mr. Pickle, that the National Association of Home Builders, along with the Department of Energy and the Treasury, enthusiastically endorsed the chairman's and our bill this morning.

Also, the uniqueness of this approach is that for the first time, rather than trying to give a credit based on the cost of the materials incorporated into a passive solar system, we use a formula that gives the credit based on the effectiveness of reducing the energy load of the home.

I think that is an important legislative step because we see what the effectiveness is and we base the credit on the formula.

In answer to the other question of the gentleman from Texas about the builders, it was testified the reason the credit is needed is the builders are not familiar with passive solar technology and construction efforts; secondly, that builders are unsure of the market for residences with passive solar systems. The purpose of the credit is to provide an incentive for builders to invest money to obtain a good passive solar design and to market these residences.

I am certainly encouraged by the results of the testimony of all the panel.

Mr. Chairman, just a couple of quick questions I would like to ask this panel just for information.

First of all, to anybody, what is the state of passive cooling technology? What do we need to do to promote it besides a lot of grants?

Mr. SCHNEBLY. Mr. Fowler, you are from Florida, is that correct?

Mr. FOWLER. Georgia. They don't claim me either place.

Mr. SCHNEBLY. I am sorry. Obviously shades and shutters are coming back. I was once in Charleston, S.C., taking a tour with Mrs. Hollings through the old houses of Charleston and noted that a lot of the fine old buildings there had interior shutters that were closed during the midday.

Those kinds of insulated shutters have now been improved with the thermax insulation manufactured out of Tampa. They are now clad with wood.

The kinds of traditional awnings that people have seen for years now have motors and sensors that raise and lower them.

Mr. FOWLER. This is the imported technology?

Mr. SCHNEBLY. That is true. There are also American manufacturers working on second generation products in combination with our friends in the computer control industry, large firms like Honeywell and Johnson Controls that are beginning to develop the cybernetic packages to properly orient those products.

Another cooling technique is the use of water storage and eutectic salt storage walls that lose their heat during the night to the night sky. There has been a great deal of research to try to make that effective in the Southeast where you don't have the radiational cooling that you have in the West.

But this allows the storage of the coolness that you can get at night with proper ventilation for the daytime periods, so that in the winter, you close it up when the sky is no longer bright and you open it up in the morning through automatic shutters or manual shutters, depending on the amount that can be afforded to be spent.

This kind of technology introduces automatic vents for double envelope buildings and plenum spaces for more complete air conditioning and ventilating. Ground tubes go out from the house a number of yards underneath the dirt, picking up the cool air, and ground temperature air to bring it into the house itself. This is an attractive technology for dramatically reducing air-conditioning loads and taking advantage of the lower night temperature and storing coolness. Air conditioning can then be run off peak at night to balance with the utilities' load curve characteristics and their base load coal and nuclear future generation options.

Mr. FOWLER. Mr. Chairman, in hearing that, I find that I may have to, under our ethical rules, disqualify myself from this whole discussion. I have been trying to get a hole fixed in my roof for about 6 months and have been unable to do so.

I may be eligible for a tax credit under a passive cooling system.

One other question along the lines of your answer; that is, you heard from this morning my concern, all of my concern, about trying to find a way to construct a larger, all-encompassing tax credit for retrofitting.

You are the ones who do the work. What is available now, in technology of a passive nature, that would be the most cost effective retrofitting for the average American home?

Mr. BROWNELL. Add glass to the sunny side of the house and remove it from the nonsunny side.

Mr. FOWLER. I am sorry? Remove what?

Mr. BROWNELL. Adding a window, an extra window, to the sunny side of the house and removing one from the nonsunny side. Extra insulation, which is obvious, combined with that will make a big difference.

In the Northeast, a typical 15-square-foot window on the south sunny side is worth $17 a year—at today's energy costs—above and beyond placing that same window foot on the north side.

As people are more aware of that, you will see more square feet of south glass.

Mr. FOWLER. Anybody else?

Ms. DOTSETH. I think there is also a great interest in the development of the solar greenhouse, the add-on room. Some of the major manufacturers are developing solar greenhouse kits. You can go to the lumber dealer-distributor and purchase add-on this kit, increasing the collection area and adding a room to the house. That is another excellent retrofit option, the solar greenhouse market.

Mr. WARNER. I might add our firm is designing and presently have final designs done on what we call an atrium-type window which is designed particularly for this market. It comes up vertically and slants on the angle up to the house and can be designed as a retrofit item specifically for that market.

Mr. DELAQUIL. Skylights are another excellent way to get good passive solar penetration.

Mr. SCHNEBLY. Replacing the kinds of draperies that have an air plenum that allows the heat to come in during the day and either escape through air filtration in the windows or rise to the ceiling and overheat in the—summer, replacing those with the kinds of shades that would have edge tracks and reduce air filtration and act as a firm, thermal barrier against the kind of heat that could be gained through windows in the south is an excellent retrofit air conditioning load controller.

Mr. FOWLER. Any of you that would care to drop me a line as to any sort of incentive program that you would recommend to aid retrofitting in conjunction with the legislation that we have for new residences with builders and developers, any of us would be very pleased to receive that.

Mr. DELAQUIL. Do you want it to your attention, Mr. Fowler?

Mr. FOWLER. That would be fine. I will make sure the chairman sees it. I am his AA.

The CHAIRMAN. You are very helpful in this field and one of the leaders certainly for passive solar.

Mr. Pickle?

Mr. PICKLE. This may be an obvious question to you; but if you design a house and you face the house to the south side, it gets the sun from that angle.

From an architectural design, does this mean that the houses have all got to be shaped differently than they are now?

Have we got to change our designs much or can we expect that they could have regular rotation over the city?

You won't see a house and say, that is a robot; it looks like an arm sticking up in the sky?

Mr. BROWNELL. No, sir. Proper passive houses don't necessarily have to have their shapes changed. They will still continue to be rectangular largely with a small peak under the roof. They will have to be changed; generally the long wall of the house needs to be oriented south, and so you are going to not see them oriented as we have for the past 50 years to the road but to the sun.

Mr. PICKLE. It makes some difference but not an appreciable difference in design?

Mr. BROWNELL. They can be oriented 15 or 20 degrees east or west of south, and the subdivision can still have some nice individualism.

Mr. PICKLE. Some differences in some locations. You can't have them all in a perfect location. If a builder has to build 20 homes he can't give them all choice lots. Some he just can't really get the maximum out of; is that right?

Thank you, Mr. Chairman.

Mr. FORD. I don't have any questions, but I would like to make a comment.

It is obvious that what we are talking about today is not well known to the public. I think the tax incentive that we address in this bill today is one good way of getting this technology started in the decade of the 1980s.

I think it is needed, and I would like to compliment the chairman and the other colleagues who offered this legislation before this Congress. I want you to know that I fully support the intent of the legislation and will support the passage of the legislation before the committee.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much, all of you who are witnesses. It has been a very valuable hearing.

The committee will stand adjourned, subject to the call of the Chair.

[Whereupon, at 3:35 p.m., the hearing was adjourned.]

[The following was submitted for the record:]

STATEMENT OF HON. GARY HART, A U.S. SENATOR FROM THE STATE OF COLORADO

Mr. Chairman, I appreciate the opportunity to testify this morning on legislation to provide a tax credit to builders who incorporate passive solar energy systems in new homes. I commend you and Representatives Fowler and Heftel for the leadership you have demonstrated on this issue, and for working to build a legislative record on passive solar through this hearing.

As you know, last year the Senate overwhelming endorsed this legislation, adopting it as an amendment to the Windfall Profits Tax bill by a vote of 82 to 1. Unfortunately, it was not part of the compromise which ultimately emerged from the House-Senate conference on that bill. I am confident, however, that with your support and the support of the nearly 100 members of the House who have now cosponsored this measure, this Congress can enact a passive solar tax credit in the very near future.

If we are serious about encouraging the use of currently available, cost-effective alternative energy sources, then it is essential that we provide meaningful incentives for the use of passive solar energy. Passive solar techniques are hardly novel. More than 400 years ago, the cliff dwellers of Mesa Verde in Western Colorado made simple adaptations to capture and store the sun's energy during the chill winter months, and deflect the sun's scorching summer rays. Today, passive solar

techniques are still relatively simple and inexpensive. But a well designed passive solar system can reduce the heating load of a standard home by as much as 80 percent.

In general, passive solar systems are the most cost-effective solar technology for heating and cooling homes. Passive solar is a sound investment today which will reap additional benefits as the cost of fuel oil, natural gas, and electricity continues to rise. The potential of passive solar systems to reduce our reliance on conventional energy for residential space heating and cooling is significant.

While opportunities exist to add passive solar features to existing homes, the greatest potential for energy savings is realized when passive solar systems are incorporated as part of the original design of the home. Since the nation's entire housing stock is expected to be replaced over the course of the next 50 years, it is vitally important that new housing incorporate passive solar systems, as well as other energy efficient features, if future generations are not to be locked into increasingly costly and uncertain supplies of energy for their residential needs.

The key question, Mr. Chairman, is if passive solar makes economic sense today, why are builders not including passive solar features in new housing? Although a passive solar system will often pay for itself over the the course of just a few years, this savings accrues to the owner of the house rather than to the builder. Builders and developers who must compete in an extremely tight capital market, are understandably hesitant to make any addition to a home which will increase its cost.

Additionally, the homebuilding industry in this country is dominated by small businesses which construct, on the average, only 9 homes a year. Small homebuilders cannot afford the risk that the public will not readily accept—or cannot find the financial backing for—passive solar homes. Given these barriers, there is a clear need to provide a strong incentive to builders to include passive solar features as an integral part of new housing.

Mr. Chairman, last year the Los Alamos Scientific Laboratory estimated that approximately 220,000 new homes would incorporate passive solar energy systems as a direct result of the tax credit I have proposed. They further estimated that in the period 1985 to 1990, an additional 350,00 to 400,000 new homes would be built with passive solar energy systems as a direct result of changes in the building industry and in public demand for energy conservation and housing. The passive solar tax credit proposal offers Congress an opportunity to, in effect, establish a passive solar demonstration program while avoiding the additional costs of bureaucratic program administration. Those using the credit in the years ahead will provide the examples needed to stimulate others to enter into passive home construction. As the savings potential of passive solar design becomes better known through this process, even more homes will be built at no cost to the Treasury.

The legislation before this Committee is a carefully crafted proposal based on an innovative tax credit formula. Despite long-standing Congressional interest in passive solar, it had not been possible to implement a residential passive solar tax credit in the past because of difficulties in determining how to provide a tax credit for components of a home which serve a dual function. For example, a Trombe wall which stores heat, a passive solar function, as well as supporting the ceiling—a structural function.

Mr. Chairman, the legislation which you and I have introduced addresses this problem by providing a tax credit to builders of new homes based on their effectiveness in reducing the energy load of the home, rather than providing a credit for a percentage of the cost of the components of a passive solar system. This approach has the additional advantage of encouraging the use of low-cost, high-performance passive solar designs.

I need not describe in detail for you the various provisions of this legislation. Let me emphasize, however, that the definition of what constitutes a passive solar home has been carefully developed with the fullest possible participation by the Treasury Department and the Internal Revenue Service. Following the Senate's adoption of this measure last year, Assistant Secretary of Treasury Donald Lubick stated: "We believe that the credit would be extremely simple for taxpayers to compute and would be no more difficult for the Internal Revenue Service to administer than most tax credits * * *. Moreover, the IRS should have no difficulty verifying the underlying information. Since the credit is computed on a house-by-house basis, reference to blueprints will indicate the presence of the five recognition factors which comprise a passive solar system and qualify a home for the credit."

Mr. Chairman, this Congress should enact the passive solar tax credit soon. Since I first introduced this proposal in 1979, it has enjoyed very strong support both in the Senate and among a broad coalition of industry, labor, and environmental groups. It has been endorsed by a number of national organizations, including: National Association of Home Builders; National Conference of State Legislatures;

National League of Cities; Sierra Club; Friends of the Earth; Environmental Action; National Wildlife Federation; Environmental Policy Center; League of Women Voters; Solar Lobby; American Institute of Architects; and National Woodwork Manufacturers Association.

Mr. Chairman, the reality of this nation's energy situation makes it vitally important that new housing incorporate passive solar systems. The proposals now pending before the House and Senate provide important incentives toward that goal. Again, I commend you for your efforts in this regard, and I look forward to working closely with you and all of our colleagues in the weeks ahead to enact this legislation.

STATEMENT OF HON. DON ALBOSTA, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. Chairman, I would like to begin my statement by commending the Committee for interrupting its very busy schedule to hold a hearing on legislation to provide tax credits for passive solar applications.

I intend to make several specific suggestions but a few general observations are important first. The most important problems facing this nation are energy supply and price problems, inflation, unemployment, and threats to our national security due to our dependence on foreign oil. To offset inflation and to help create private sector jobs, people are calling for tax cuts. This Committee has before it a proposal that will help to solve all of these problems. This approach allows for the maximum involvement of private enterprise and individual ingenuity. It will encourage productive investment at home to replace counterproductive spending for foreign oil.

The bills under consideration by the Committee are quite good. I would like to share with the Committee a few questions and suggestions that may contribute to the discussion.

For most of the technical suggestions, I have my consitutent, Mr. Edward J. Russell to thank. Mr. Russell is a physicist and an energy and mechanical design engineer. He has been working in the passive solar field for some time.

Mr. Russell lives in Gladwin, Michigan, where citizens and the local government are working together to save energy and produce as much of their own energy in as environmentally sound a manner as possible. They find it frustrating that one of the most cost-effective and basic energy saving approaches is not given a tax incentive. The lack of credits has been for them and for many Americans a stumbling block for the implementation of passive solar techniques such as heat-generating greenhouses that can be built into homes, and may other techniques. I would hope that a credit bill reported by this Committee could encompass such techniques.

So, it is our hope that you will be able to provide a passive solar tax credit. Before I move on to specific suggestions on this bill, I would like to applaud the recent signs that the Committee may also soon consider a tax credit for wood stoves and efficient wood-burning equipment.

I am not in favor of giving tax credits to every good idea that comes down the pike. I am in favor of using tax credits to fight our Nation's most urgent problems: energy security, unemployment, and inflation.

I am convinced that these tax credits will pay off—that they will be justified in terms of increased investment in these areas well beyond what our people can afford to spend without them.

The combination of tax credits for passive solar and for efficient wood-burning techniques would be the best new step towards energy self-sufficiency in my area, and perhaps the country, that I could imagine at this point.

There are a number of general concerns and specific points I would like to raise about the bill even though I think it is generally very good and much needed.

ADD PERFORMANCE STANDARD TO INCLUDE NEW SYSTEMS

I recognize the need to be specific enough to provide firm guidance to the Internal Revenue Service, yet I hope the Committee will consider the dangers of focusing tax incentives on a particular type of passive solar system to the possible exclusion or detriment of other commendable systems. This problem might be resolved by establishing in the law a dual system of descriptive standards on the one hand and a performance standard on the other. If either could be met by the applicant, then the applicant or taxpayer-builder would earn the credit.

If administration of a performance-based credit that required individual analysis would be too complicated, then we could require the Secretary to award a credit to any new system type that could be shown to be effective in reaching energy savings

or performance equal to the presumed energy savings of the system(s) described in the legislation.

This would allow systems that are now being developed but are not yet as widely accepted as the system described in the bill to compete for the credit.

INDEX CREDIT TO INFLATION IN ENERGY

Another overall concern is that the credit remain comparable to the intended savings. One method might be to tag the credit to the price of fuel oil. For instance, instead of $60 for each 1 million Btu's of annual savings per residential unit, we might provide a credit equal to the price of 60 gallons of fuel oil. This would tie the credit directly to the object of the bill—petroleum-based fuel displacement. It would also keep the bill current in terms of inflation in the price of energy. A national average price could be used for the credit rate.

For simplicity's sake the credit could be indexed to the cost-of-living. Whatever method is used, it should not become so small as to be only a paper incentive. It is already somewhat limited considering how high housing costs have become in recent years.

Another concern about the bills as introduced is that they do not refer to existing programs or criteria as often as they might. We would do well to specifically refer to related efforts if we intend to rely on them. For instance, the tables referred to in the bill are difficult to picture clearly unless one imagines that they might be similar or identical to the tables to be used by the Solar and Conservation Bank in the Department of Housing and Urban Develpment.

We might also be better off if we were to have fewer Reference Houses in Federal Regulations.

The Reference House of subparagraph (C) on page 8 raises a couple of questions. The first question is whether we could refer to an already existing standard or use existing criteria such as the standards for energy requirements in buildings adopted by the Department of Housing and Urban Development. On the other hand, I am informed that the heating load of the "reference house" may be a little low. My engineer-constituent, Mr. Russell, estimates that the average "stick-built" house being built in Michigan has a heating load of around ten Btu's per square foot per degree day.[1]

There is a policy question here of whether we want to reward builders with a tax credit beyond the point where we would not subsidize the same builder with a Federal loan. That is, if we would not subsidize a new standard sized house with a heating load of more than, let us say, 6.5 Btu's per square foot per degree day, then should we pay someone for the savings between that maximum and the reference house standard? It may be that we will not have that question to face yet, but we are likely to be confronted with it when the Department of Energy promulgates the recently delayed Building Energy Performance Standards.

Perhaps the best approach is terms of energy savings is to pick a standard that recognizes the prevailing practices now, but amend that standard reference figure if the prevailing practice improves markedly before the expiration date of the credit.

There are several more specific questions I have as well.

NONMOVING COLLECTION AREA

The definition of "Solar Collection Area" includes in paragraph (B) at line 12 what may simply be a drafting error. Rather than requiring that a passive system have a collector whose position may be change which could be read as "must be moveable," it might be wiser to allow at least in addition, a stationary one at any angle which allows for the collection of substantial amounts of solar energy or to specifically allow vertical collectors such as portions of walls and horizontal collectors such as skylights or at least allow a stationary collection area that is at an angle of within 20 degrees of the latitude of the building which would be the best range of angles for that purpose.

FLEXIBILITY OF CREDIT PREFERRED

This does bring to mind the point that this legislation should round out the solar picture so that all effective active and passive systems are recognized and accredited. Again, we should not draw this too narrowly in our attempt to exclude unworthy systems. The better course is to provide for effective oversight and tighten up

[1] Wind chill factors could be considered as well as the traditional degree days, if not too complex.

the legislation if need be considering the urgency of the energy situation and its economic and national security implication.

ABSORBER—AGAIN, BE FLEXIBLE

The definition of absorber should not necessarily include the requirement that the absorber be a "hard" surface. Water or other liquids might be used in some circumstances. For instance, phase-change chemicals or salts are often much more effective than stone or masonry, yet they are at times in the liquid state, by definition.

STORAGE MASS—NEEDED ALWAYS?

This leads us to the next point about storage mass. I hope that an absorber that is its own storage mass could be permitted. Further, I hope that a system which might not qualify for active solar credits and have no "storage mass" other than the mass of the dwelling, could still qualify if shown to be effective. As written, the statute would probably not allow such systems under the credit umbrella.

This might mean adding "or to the end use point" to the end of (C) under the definition of Absorber and eliminating the requirement (for some systems) of a storage mass as defined in the bills.

The definition of storage mass in the bills might eliminate credit for systems or parts of systems that begin to deliver solar heat to the dwelling area as soon as it becomes available in the morning rather than delaying the delivery while the mass warms up. If such systems are not covered under the active credits and actually go far beyond conventional housing designs in making solar energy available for use, then the Committee would probably want to recognize and encourage these systems.

Another question about the definition of storage mass comes up under (B) on page 5 at lines 1 through 4. What are "adequate amounts" of solar heat that the mass must store and deliver? If the concern is that the heat absorbtion capability of the mass be great enough to avoid over-heating then that should be expressed directly. At any rate, as the bills are drafted, there is too much discretion and not enough guidance either in the language of the bills or by reference to another guideline or standard.

Again, flexibility without ambiguity should be the goal. The definition and requirement of storage mass is too restrictive, possibly eliminating the use of phase-change materials which have a tremendous heat storage capacity in very low volumes. At the same time, however, the undefined term "adequate amounts" could lead to a thwarting of the legislative intent by the department.

HEAT REGULATION DEVICE DIVERSITY

I have been asked to note and emphasize the phrase "nighttime insulation or its equivalent" in the definition of heat regulation device and to add the clarification at least for the record that the interior we are concerned about is the intentionally heated or cooled interior and not necessarily every space that might be within a wall or other barrier. My engineer-constituent would add that "such insulation need not be on the glazing itself but could be between the glazing area space and the other heated areas of the house."

CREDIT TABLE—CLARIFY

Without a reference to other standards or some clarification, it is not exactly clear how the table is to be prepared or used as I mentioned earlier. Questions include: What are the eight categories referred to on page 7 lines 12 to 18? Are they different areas of the country or different types of housing, or what? Page 8 contains two provisions labeled (i) and (ii): apparently (ii) would provide an estimated energy saving for each configuration and location and (i) would provide the total credit allocated for that savings. It would encourage individual initiative in design even more if the credit could be earned for performance that is verifiable even if the configuration or system was not exactly that described by the bills. For instance, a system with a smaller than usual solar collection area but a better storage or delivery system could still qualify for an equal credit.

Technical questions aside, I believe that it is time for this country to recognize and encourage the tremendous potential for energy conservation found in passive solar design. The legislation under consideration by the Committee can provide this encouragement after some relatively minor adjustments. I hope we can make the passive solar tax credit available to the American people very soon.

One last word is that there are many homeowners who would like to add solar systems to their homes. It is more efficient to incorporate passive solar systems in new homes as they are built, but that does not mean that after proper conservation

steps are taken, passive solar might not have a place in our tax credit plan. I would encourage the Committee to investigate credits for "retrofitting" as well as for new homes if retrofitting cannot be included in this year's legislation.

It would be fairly simply to provide tax credits for passive solar retrofits by directing the Internal Revenue Service to amend their recently promulgated regulations. The Congress could require that if passive solar retrofits meet the criteria for passive solar systems outlined in either this legislation or even the regulations as promulgated, then even the "structural" elements of those retrofit systems which may serve a dual purpose will receive at least a partial credit. This would allow the owner of a home to add a heat-collecting solar greenhouse, "trombe" wall, an additional south-facing double-glazed window, movable insulation devices, exterior shading devices such as awnings and shading screen materials, or other similar devices that will generate significant energy and save considerable amounts of non-renewable energy.

Thank you.

Statement of Hon. Millicent Fenwick, a Representative in Congress From the State of New Jersey

Mr. Chairman, Members of the Committee: As a coponsor of H.R. 7688, I want to let you know of my strong support for legislation which would provide a tax credit to builders who incorporate passive solar design and building techniquee in the construction of new homes. As you know, the Senate passed a similar measure in this Congress, and I was disappointed to see it dropped from the conference report on the so-called "windfall profits tax" bill.

The builders with whom I have spoken endorse this legislation. Facing a very difficult and tight capital market, and often uneducated homebuyers, builders now find little incentive to include important energy saving features in new homes. Yet the importance to our national energy policy of conservation, and of the efficient use of natural resources, like the sun, cannot be overstated. No other issue has demanded the attention of this Congress as urgently as our intolerable dependence on oil imports—that fact alone should make passage of this legislation a top priority.

While some may argue that passive solar energy techniques pay for themselves even without the proposed tax credits for builders, it is important to remember that these benefits accure to the owner of the home, not to the builder who must bear the cost of including them. The proposed credit, which will be based on the performance of the house in saving energy, is a cost-efficient alternative to some of the expensive energy programs that this Congress has considered. And, perhaps even more importantly, the benefits of a passive solar credit will begin to be realized in the very near term after its enactment.

This legislation has been endorsed by many groups, including the Solar Lobby and the National Association of Home Builders, and many other Members of Congress. I wish to add my name to the list of enthusiastic supporters.

Thank you very much.

Statement of Ronald D. Doctor, Commissioner, California Energy Commission

Introduction and Definition

Passive solar design can save between 1.2 and 2 billion BTU's of energy over a conventionally designed building over a 30 years life, and is the most cost-effective application of solar energy today. The fact that passive design works and is cost-effective is evidenced by the thousands of new passive homes being constructed in California each year and resulting lower utility bills which are one-half of non-solar homes.

The importance of a federal passive solar tax credit to the continued development of the industry and the increased use of solar technologies is undeniable. Not only does the credit help to offset the first costs of passive solar installations, it more importantly helps to counterbalance the substantial subsidies that exist for conventional fuels permitting the consumer to take advantage of the competive life cycle costs of passive solar design.

To quote the current regulations for tax credit in California, a passive solar system is defined as a design which utilizes "the structure of the building and its operable components (and the climate resources available at the site) to provide

heating or cooling during the appropriate times of year". Eligible passive solar systems include three main generic types (see Regulations with attachments):

Solar glazing.—The proper orientation of south-facing glass in a building.

Solarta.—An attached greenhouse which warms the building in winter.

Thermal ponds.—Roof ponds installed in buildings which collect the sun's energy in the winter, and dissipate the sun's heat in the summer.

The following devices become eligible when installed in conjunction with a Passive Thermal System:

Movable insulation.—Insulated shutters or shades which prevent heat loss from windows.

Exterior shading devices.—Roof overhangs, wing walls and exterior shades and screens that prevent summer over-heating.

Reflectors.—Highly reflective devices which augment solar gain through windows during the heating season.

Other glazing control.—Films, tints and other measures which insulate and shade the glass in the building.

Ventilation devices.—Air intakes, exhausts and thermal chimneys which assist in ventilating the building.

Thermal mass storage.—Water, concrete, masonry and rock which store thermal energy.

Subterranean construction.—Buildings which are excavated or bermed using each as an insulator.

HISTORY OF THE CALIFORNIA TAX CREDIT

California's first solar energy tax credit, enacted in 1976, allowed a state income tax credit of 10 percent (up to $1,000) of the purchase and installation costs of solar energy systems. In 1977, the credit was expanded to 55 percent (up to $3,000) for systems which cost less than $12,000 and to 25 percent for systems installed on other than single-family dwellings which cost more than $12,000. The following year, several significant changes were enacted to strengthen and clarify the solar tax laws: wind energy systems became eligible, the credit for condominiums was increased, and builders were permitted to "pass-thru" the credit to purchasers of new homes.

The California tax credit is due to expire on December 31, 1980. An extension of the tax credit (AB 2036), which includes credit for passive solar design, has already passed the State Legislature and is awaiting Governor Brown's signature.

THE RESULTS OF THE CALIFORNIA SOLAR TAX CREDIT

Since 1975, over 60,000 taxpayers in California have benefited from the solar tax credit. (See attachment "Analysis of the Solar Tax Credit Returns—1978.")

Although $35 million in credits have been awarded, the energy savings have been great. Assuming the average annual savings from solar per installation has been $100, Californians have already saved $19,100,000 in utility bills. These savings will continue over the next several years.

California's experience seems to indicate that developers are especially motivated by the present solar tax credit. Under California law, a solar tax credit can be taken for each passive solar system installed. A developer, therefore, can accrue multiple credits. The attachment in the Appendix entitled "Solar Housing Development in California" illustrates the large number of solar developments already built in California. Certainly, the tax credit, available to the builder, has been a valuable incentive.

THE EXPERIENCE OF THE CALIFORNIA ENERGY COMMISSION

There has been a direct correlation between education of the public and the number of solar installations in the state. The California Energy Commission is actively promoting the use of passive solar design in buildings through several brochures and books it publishes. (See example brochure with attachments.) The Commission's Sundial Hotline also offers information to callers and helps to promote the use of passive design principles. Additionally, our State Building code offers passive design option guidelines. The Commission's Builder Assistance Program has commitments from builders to construct 30,000 new passive solar homes this year.

RECOMMENDATIONS FOR FEDERAL LEGISLATION

Federal legislation should include the following provisions:

Allow structural components, which are also passive solar devices, to be fully eligible for a tax credit.—In passive systems the elements to collect, store, transfer and dissipate heat are integrated with architectural elements such as wall and

roofs. For example, a wall may also be the collector and a heat storage unit. Thus an architectural element may serve the functions of heating and cooling as well as enclosing space and shaping the building. This is in contrast to the approach of traditional and active solar heating and cooling systems recognized in existing federal tax law. Combining structural functions with passive solar functions is economical and efficient.

Allow the builder/developer to take the tax credit.—Passive solar design can best be promoted through the builder/developer. It is this group of people that determines which residential designs will be offered to the potential homebuyer. Generally, the developer also has access to sufficient capital to install the needed solar devices and also pay for the added design fees involved. Their tax liability is also large and a tax credit could provide a great incentive. In addition economics of scale are available to the developer which are not available to the individual.

Allow the individual to take the passive solar tax credit.—The individual who builds a passive solar home incurs extra costs for design, siting and building. Although these costs may be small, there are no economies of scale available to the individual. Nationally it is difficult to locate existing passive solar homes for sale, so many people undertake the designing and building their own passive homes. These homes will save energy for society as well as for the individual, and thus should be encouraged through a tax credit.

Passive solar systems, added to existing homes, have been eligible for the California solar tax credit since 1977. Thousands of Btu's can be collected, distributed and stored through the addition of south facing windows, thermal mass, a roof pond or a solarium which is attached to the south side of a building. Passive solar retrofits are valuable additions to an existing building, as they help defray the cost of heating and cooling older buildings which may have been constructed with inadequate insulation and weatherstripping. In California, the taxpayer must insulate and weatherstrip the existing building when a solarium or other passive system is being claimed for tax credit. When both conservation measures and a passive solar system are added to an existing structure even greater savings can accure.

Provide rebates for low-income persons for the amount they could claim as a credit.—Few, if any, taxpayers with a gross incomce under $20,000 have a sufficient tax liability to take advantage of the credit they would receive from installing a typical passive solar space heating system. By offering a refuncable credit to households whose gross incomce is $20,000 or less, the benefits of passive solar design could be made available to a much broader range of consumers.

Accelerated depreciation (36 months) should be an option to the tax credit on commercial passive solar installations.—Investors in real property who install passive solar systems should be allowed greater choice in their use of tax incentives. If permitted to elect accelerated depreciation in lieu of tax credits, commercial entities are given greater flexibility at approximately the same or less cost.

CONCLUSION

The expansion of the federal solar tax credit is essantial if passive solar energy is to play an important role in the nation's energy future. Many argue that the government should stay out of the solar market; that the rising cost of conventional energy resources will force people to evaluate passive solar design as a purchase option; that the laws of supply and demand will propel industry growth over the next 10–20 years. Those promoting this Laissez Faire perspective contend that when passive solar design becomes cost-effective against the average cost of gas or electricity, it will be adopted in the marketplace without any government assistance. There is an interiguing logic and simplicity to this position. Laissez Faire would be the ideal standard in an ideal world. If each energy tenchology could compete from its share of the market without intrusion from non-market forces, the market would be expected to produce the best utilization of resources.

Yet no one would argue that the market in energy resources is free from non-market forces. To the contrary, the regulation and subsidization of all forms of energy is massive and pervasive. To relegate passive solar design to the free market in the face of this reality places an insurmountable barrier in the path of passive solar design implementation.

The United States needs alternative sources of energy and needs them now. The Laissez Faire approach to alternative energy resource development will delay us from reaching our goals by many years. Through authorization of tax credits for various alternative energy sources the federal government has legitimately provided incentive programs to help defray our national reliance upon costly fossil fuels and foreign oil. To exclude passive solar building design, which has proven cost-effective for reducing energy use, will only lengthen the time table for possible national

energy independence. California recommends the inclusion of a passive solar design incentive program into the federal solar tax credit.

SENATE CHAMBER, STATE OF COLORADO,
Denver, Colo., September 5, 1980.

HON. AL ULLMAN,
Chairman, House Ways and Means Committee,
Washington, D.C.

DEAR REPRESENTATIVE ULLMAN: I understand that the House Ways and Means Committee is conducting hearings on Monday, September 8 to determine whether to grant federal income tax credits to passive solar energy systems similar to the federal credits now granted for active solar systems.

I hope this letter reaches you in time because I want to urge you to adopt this important legislation. I am sure that you are well aware of the need to decrease American dependence on nonrenewable resources, especially since so much comes from foreign sources. But in encouraging use of renewable resources, such as solar energy, the government should not be discriminating in favor of active solar as opposed to passive solar, especially since evidence shows that passive systems are more cost-effective than active systems.

Some legislators have been reluctant to support credits for passive solar energy because of a fear that it would be difficult to define which elements of a house are necessary for the passive system and which elements are simply part of the house's structure. I believe the bill before you, sponsored by Senator Gary Hart, and House Ways and Means Chairman, Al Ullman, solves this problem by basing the amount of the credit on the effectiveness of the passive system rather than the investment made.

As sponsor of the amendment to include passive solar energy systems in legislation providing state tax credits for solar energy investments, I strongly urge Congress to follow the lead of numerous states which have provided state credits for passive solar systems.

Our Colorado Revenue Department is currently drafting the regulations on the passive solar credits. I would be happy to furnish you with a draft of these regulations if you like.

Thank you very much.

Sincerely,

BARBARA S. HOLME.

OWENS-ILLINOIS,
Toledo, Ohio, September 10, 1980.

HON. AL ULLMAN,
House of Representatives.

DEAR MR. CHAIRMAN: There is enclosed a brief statement which I wish to have included in the record of the September 8 hearing on your bill to provide tax credits for residential passive solar construction, H.R. 8019. Owens-Illinois continues to support the tax credit approach for providing incentives for the purchase of solar equipment by both the residential and business sectors.

The Sunpak evacuated tubular solar collector, which is manufactured by Owens-Illinois, is a second generation solar device which is more efficient and capable of reaching significantly higher temperatures than the conventional flat plate collectors. The higher level of performance of the Sunpak tube makes it suitable for replacing the burning of oil and natural gas in many business applications. For this reason, I am hopeful that the House Ways and Means Committee will consider the potential to save energy in the industry and commercial sectors when it considers tax legislation to encourage the use of solar energy.

Thank you for taking time to consider the enclosed statement. I would be pleased to meet with you, or your staff, in order to discuss the potential for business uses of solar energy. The inclusion of this statement in the record of the Committee's September 8 hearing will be greatly appreciated.

With best wishes.

Sincerely,

T. ROBERT SANTELLI,
Vice President, Energy Products and Ventures Group.

Enclosure.

STATEMENT OF DR. T. R. SANTELLI, VICE PRESIDENT, OWENS-ILLINOIS

Mr. Chairman, we are pleased to have the opportunity to submit a written statement on the subject of tax credits for solar energy during your Committee's consideration of H.R. 8019. Owens-Illinois continues to support the tax credit approach to providing incentives for the use of solar energy. Passive solar energy has the potential of displacing consumption of oil and natural gas in the residential sector so we are supportive of the general aims of H.R. 8019.

The Congress took a useful step toward establishing a viable solar industry in the United States through the increases in residential and business tax credits that were contained in the Windfall Profit Tax Act of 1980 (Public Law 92-223). Two areas that were not addressed by the Windfall Profit Tax Act were tax credits for passive solar residential construction and the need to retain the regular investment tax credit for solar equipment that is used either in part or totally for business heating and cooling. The legislation under consideration by this Committee addresses the former problem but does not touch upon the issue of business heating and cooling tax credits.

As enacted, the Windfall Profit Tax Act provides a 15 percent energy tax credit for business uses of solar energy. In the case of a solar system that is used 100 percent for industrial process heat, this 15 percent energy tax credit may be added to the 10 percent regular investment tax credit to provide a total tax incentive of 25 percent.

Owens-Illinois is one of several companies that manufactures evacuated tube solar collectors. This innovative technology is capable of heating water or air to significantly higher temperatures than the conventional flat plate solar collectors. The higher temperatures allow solar energy to be applied to a broad range of industrial process heat applications as well as both space heating and cooling. Our experience in designing solar systems for industrial and other business uses has taught us that it is often more economical to design a system that both supplies industrial process heat and also heating and cooling for buildings. Unfortunately, such multiple use installations would not necessarily qualify for the regular investment tax credit. While the Internal Revenue Service has not yet promulgated rules on the implementation of tax credits for industrial solar applications, we fear the loss of the entire 10 percent investment tax credit leaving an incentive of only 15 percent for most business solar applications.

A 15 or even a 25 percent tax credit for business is nowhere near as generous as the 40 percent residential tax credit. By establishing such a large disparity between incentives for business and residential applications of solar energy, the Congress is establishing the policy that solar energy used to supply energy to homes is much more desirable than solar energy used to supply the same amount of energy in factories. We feel that a more even-handed approach toward solar energy incentives in businesses and residences would allow the marketplace to decide where the most economical uses of solar could be made.

Owens-Illinois has studied the size of the business solar market and has found it to be vast. We feel that a balanced program of incentives for both residential and business uses of solar would result in a healthier solar industry. For this reason, we urge you to consider extending the regular investment tax credit for all business uses of solar energy including commercial solar heating, cooling, and hot water. This technical change would clear the air and allow businesses to purchase solar equipment with the confidence that they would obtain a tax credit of 25 percent which many thought Congress had intended for all business uses of solar in the Windfall Profit Tax Act. We further believe that our nation's energy problems are sufficiently severe to justify providing a rapid depreciation for solar equipment bought by business. This would provide an additional incentive for companies to replace the burning of precious oil and natural gas with abundant solar energy for numerous applications.

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